QUALIFICATION TEST REPORT

QTR 10000070

LIBRARY

Probe, Retractable, Angle of Attack

Transducer

U. S. Science Part No. 10000070

Prepared for
George C. Marshall Space Flight Center
Huntsville, Alabama

Contract No. NAS8-2456

by

U. S. Science Corporation
5221 W. 102nd Street
Los Angeles 45, California
Avionics Division

H. E. Schauwecker, Vice Pres., Engineering, being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Subscribed and Sworn to before me

this 16 day of Nov., 1961.

Notary Public
in and for the State of California with
principal office in the County of Los Angeles.
My commission expires Feb. 9, 1965

Prepared by
M. A. LaVere
Test Engineer

Approved by
J. R. Miller
Manager - Avionics

Date November 16, 1961

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I. Administrative Data.

Subject: This report presents the Qualification Test Program applied to the U. S. Science Corporation, Probe, Retractable, Angle of Attack Transducer, P/N 10000070.

Purpose: The purpose of the test program was to evaluate the performance capabilities of the subject transducers under the extremes of the various environmental conditions.

Applicable Specifications and Documents:

a. USSC Specification Control Drawing 10000070.
b. USSC Test Procedure ITP 19600.
c. USSC Test Procedure PTP *12792-15.
d. Applicable Portions of MIL-T-19229A (WEP).
e. Applicable Portions of MIL-E-5272A.
f. Applicable Portions of ABMA Report DSF-TM-7-39.
g. Applicable Portions of Report DRR-TM-2-60.
h. Contract No. NAS8-2456.
i. Applicable Portions of NASA, Guidance and Control Division Preliminary Environmental Requirements for Saturn Booster (SA-1, SA-2, and SA-3).

Specimens: Two units, received from NASA as Government Furnished Equipment were subjected to the test program as described in Contract No. NAS8-2456 and as modified by other applicable specifications or by the resident NASA representative.

Equipment: Test equipment employed in the test program is listed and described specifically under each test performed at U. S. Science Corp. and within the body of the reports submitted by the authorized sub-contracted test laboratory. All instruments required for test evaluation or measurement have been calibrated against accepted laboratory standards at approximate six month intervals.

Standard Test Conditions: Unless otherwise noted within the specific test reports, the test conditions under which these tests have been performed were as follows:

Temperature, +20° to +40°C
Atmospheric Pressure, 29.92" Hg.
Vibration, Lab ambient
Humidity, Lab ambient

*See page 42 of this report.

I. Administrative Data. (Cont'd.)

Test Program		Sample No.	
		1	2
Test No.	Serial Number Identification	SN 107	SN 113
1	Acceptance Test per ITP 19600	1 and	2
2	Dynamic Shock	-	2
3	Altitude Shock	1	-
4	Vibration	1	-
5	Rain	-	2
6	Low Temperature Exposure	1	-
7	Low Temperature Operation	1	-
8	Acceleration	-	2
9	Humidity	-	2
10	High Temperature Exposure	1	-
11	High Temperature Operation	1	-
12	Heater Element Endurance	1	-
13	Salt Spray	-	2
14	Sand and Dust	-	2
15	Fungus (statement of non-nutrients and description of materials.)		
16	Endurance	1	-

Note: The sequence of testing was modified from that listed in NASA Contract NAS8-2456. The revised sequence was necessary to accommodate the resident NASA representative whose purpose in visiting U. S. Science Corp. was to witness those tests which evaluate the dynamic capability of the instrument. (Refer to TWX, Page 42 of this report.)

I. Administrative Data. (Cont'd.)

Security Classification:	Unclassified
Date Test Completed:	11/3/61
Tests Conducted by:	Michael A. LaVere, Test Engineer J. Thompson, Test Technician C. Arbeau, Test Technician Rototest Laboratories (Sub-Contract Test Lab)
Disposition of Specimens:	The test specimens retained at U. S. Science Corp. for NASA disposition.

FACSIMILE COPY

CONTRACT NO. NAS8-2456
U. S. Science Corporation

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ARTICLE	I	SCOPE OF WORK
ARTICLE	II	PERIOD OF PERFORMANCE - DELIVERY
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NASA Form 437-1	SIGNATURE PAGE
NASA Form 417 (6-61)	GENERAL PROVISIONS 1 THROUGH 35

To the extent of any inconsistency between the Schedule, the General Provisions and any specifications or other provisions which are made a part of this Contract by reference or otherwise, the Schedule and General Provisions shall control. To the extent of any inconsistency between the Schedule and the General Provisions, the Schedule shall control.

a. The Government reserves the right to observe or perform surveillance as may be deemed necessary on any or all tests performed under this Contract.

b. Test Samples: The test samples shall be two units taken at random from the production activity which must be built according to the requirements of all applicable drawings and specifications. Unless tests to destruction are specified, the units may be repaired and placed into service use after testing, if so permitted by the procuring activity, and will be an additional procurement beyond those of the normal production in process.

(1) Number of Units Required for Test.

Two 10000070 Retractable A/A Transducers shall be used to perform the following test schedule:

Test	Sample No.
(a) Acceptance test per ITP 19600 and PTP 12792-15.	1 and 2
(b) Low Temperature exposure.	1
(c) Low temperature operation.	1
(d) High temperature exposure.	1
(e) High temperature operation.	1
(f) Endurance.	1
(g) Acceleration.	2
(h) Vibration.	2
(i) Dynamic Shock.	2
(j) Rain.	1
(k) Altitude Shock Test.	2
(l) Humidity	2
(m) Salt spray.	2
(n) Sand and dust.	2
(o) Fungus.	1
(p) Heater endurance	1

SCHEDULE

ARTICLE I - SCOPE OF WORK

A. The Contractor, as an independent Contractor, and not as an Agent of the Government shall use its best efforts in providing the necessary personnel, facilities, materials, and all other things necessary for or incident to the performance of the work described in the following paragraphs and enclosures as may be referenced.

B. In the event of malfunction or failure, the Contractor shall investigate the cause and make recommendations which will prevent a recurrence of that malfunction or failure. An interim report will be made immediately with recommendations for design action. The Contracting Officer will direct the necessary design action. Re-tests will be performed to prove redesign feasibility.

C. ENVIRONMENTAL TESTING.

1. Scope: This Contract covers the requirements for the environmental testing of U. S. Science Corporation Retractable Probe type Angle of Attack transducer P/N 10000070. The testing of the Angle of Attack Transducer P/N 12791-15 contained therein.

2. Applicable Specifications: The tests will be conducted to the following enumerated specifications, drawings, and recommendations.

a. U.S.S.C. Specification Control Drawing 10000070.

b. U.S.S.C. Test Procedure ITP 19600.

c. U.S.S.C. Test Procedure PTP 12792-15.

d. Applicable portions of MIL-T-19229A(WEP).

e. Applicable portions of MIL-E-5272A.

f. Applicable portions ABMA Report DSF-TM-7-39.

g. Applicable portions of Report DRR-TM-2-60.

3. Test Schedule: The test schedule will define the sequence of tests to be performed.

4. Acceptance Tests:

All units shall be subjected to this test before commencing any of the above noted tests.

a. Subject units 1 and 2 to all the tests defined in U.S. Science Corporation ITP 19600 referenced herein. These results shall be approved by the appointed authority before commencing any further test program, and shall form the basis of comparison during the tests.

5. Low Temperature Exposure: The unit shall be placed in a test chamber and mounted such as to allow the operation of the retracting mechanism. The chamber temperature shall be reduced to -54°C (-65°F) for a period of 48 hours. Perform visual examination.

6. Low Temperature Operation: Raise chamber temperature from that shown in paragraph 5 to -17.0 ± 1°C (0°F) and allow to stabilize for a period of 4 hours.

a. Test.

(1) The extend switch shall be engaged and the time to extend tabulated.

(2) The retract switch shall then be engaged and the time taken to retract tabulated.

(3) Repeat the tests of (1) and (2) 5 times.

(4) Return unit to room ambient conditions and perform tests specified in ITP 19600 and PTP 12792-15.

7. High Temperature Exposure: The unit shall be placed in the test chamber and mounted such that the retraction mechanism can be operated. The test chamber shall then be raised to a temperature of 93° + 2°C (200°F) for a period of 24 hours. A relative humidity of not more than 15% shall be maintained throughout the tests. At the end of this period perform a visual examination of the product.

8. High Temperature Operation:

Reduce test chamber temperature from that shown in Paragraph 7 to 71°C (160°F) and allow to stabilize for a period of four hours.

a. Test

Perform tests as shown in ITP 19600 and PTP 12792-15.

9. Endurance:

The unit shall be set up on a stand such that the extend and retraction mechanism can be operated without damage to the probe of the transducer. A timing circuit shall be attached to the extend-retract switching mechanism to give the following operational cycles.

Extend	maximum time -	20 seconds
Power off		20 seconds
Retract	maximum time -	20 seconds
Power off		20 seconds

The above constitutes one duty cycle. N.S. As it is considered that the motor, or micro-switches, will be the governing factor of the retraction mechanism life, it is proposed to run a mean time to failure on all components. Thus, it is permissible to change a switch or motor after failure provided that the failure time and condition is recorded.

a. Test.

The duty cycle shall be repeated for 100 hours. At this point the unit shall be removed from the fixture and subjected to the tests of ITP 19600.

b. Duration.

The tests of a. shall be repeated until 100 hours have been accumulated.

10. Acceleration:

The unit shall be mounted on a fixture such that acceleration can be imparted along the line of flight on the C.G. of the transducer at 20 g for 5 minutes and on each of the other two planes and in each direction at 5 g for 5 minutes with the probe extended.

a. Test. At the conclusion of the above test the unit shall be subjected to the Acceptance Test of ITP 19600 and PTP 12792-15.

11. Vibration:

This vibration test is intended to perform a two fold function:

a. To determine that the retraction mechanism is functional after such tests.

b. To obtain the vibratory condition seen by the transducer.

(1) Test Condition.

The unit shall be mounted on a fixture which will enable all three mutually perpendicular axes to be tested in sequence, with an assimilated air stream of 150 knots passing over the probe.

(a) Scan the frequency range from 20 to 2000 cps in a time span of 10 minutes. Repeat twice observing all resonant points under the following conditions:

20 - 50 cps at 2 g.

20 - 110 cps at .016 in D. A. displacement.

110 - 2000 cps at 10 g.

The unit shall be subjected to the above scan for the three mutually perpendicular planes.

(b) At any resonant frequencies encountered for a period of ten minutes in any of the three planes under the following conditions:

20 - 45 cps at 1 g.

45 - 95 cps at .01 in D. A. displacement

95 - 2000 cps at 5 g's

(c) Tests.

At the end of each resonant frequency test subject the unit to tests specified in ITP 19600 and PTP 12792-15.

12. Shock:

The shock test shall be conducted as specified in MIL-E-5272C Procedure 3 paragraph 4.15.3 as herein modified.

a. Perform 6 tests on each of the 3 major axes of the unit using one of the following conditions.

(1) 20 g for ten milliseconds at chassis (triangled sawtooth waveform).

(2) 20 g for eight milliseconds at chassis (Sinewave).

(3) 20 g for six milliseconds at chassis (Square wave).

b. After each plane of shock testing perform the test of ITP 19600 and PTP 12792-15.

13. Altitude Shock Test:

a. Equipment Required.

(1) Vacuum chamber with a minimum of 15 x volume of unused portion of retraction housing.

(2) Mounting plate with sealing gasket and vacuum coupling.

b. Set Up.

(1) Seal mounting plate to forward face of retractable housing.

(2) Connect vacuum hose couple vacuum chamber bleed valve to mounting plate connector.

c. Procedure.

(1) Reduce pressure in vacuum chamber to .0855 inches of water with bleed valve closed.

(2) With vacuum pump running and probe in extended position open bleed valve.

(3) Allow pump to run until a vacuum of .0856 inches of water has been stabilized. Note time to fulfill this requirement.

(4) Close tank bleed valve. Open vent to allow normal atmospheric air to bleed into retractable housing as quickly as possible.

(5) Subject unit to test defined in USSC ITP 19600 and PTP 12792-15.

14. Humidity:

The test shall be performed in accordance with MIL-E-5272C, paragraph 4.4 Procedure I except that $10^{\circ}F$ _° shall be maintained during the last three hours of each 24 hour cycle with no humidity control.

15. Salt Spray:

With the unit in its retracted position, perform salt spray test as specified by MIL-E-5272C, paragraph 4.6, Procedure I and Federal Test Method Standard No. 151, Method 811.

16. Sand and Dust:

a. The unit shall be mounted in a similar manner to its normal installation and with the probe in the retracted position, the test shall be performed as per MIL-E-5272C, paragraph 4.11.1, Procedure I.

b. The unit shall be functionally tested as per USSC ITP 19600 and PTP 12792-15 upon completion of these tests.

17. Fungus:

a. The unit shall be subjected to a fungus test as described in MIL-E-5272C, paragraph 4.8, Procedure I. Unless a certificate of total absence of fungus nutrients can be supplied by USSC.

18. Rain:

a. This test is to be performed in accordance with MIL-T-19229A, paragraph 4.6.19.

b. The unit shall be tested per ITP 19600 and PTP 12792-15.

19. Heater Element Endurance:

a. This test shall be performed with probe extended in a wind tunnel at approximately 110 knots.

b. The power shall be applied to the heater and allowed to operate continuously for a period of 50 hours.

c. At each 10 hour period the current, voltage and temperature of the probe shall be monitored and recorded.

D. Reports.

1. Monthly Progress Reports. The Contractor shall submit six (6) copies of a separate monthly progress report covering all work accomplished during each month of Contract performance to this Center, ATTN: M-P&C-CA. Reports shall be in narrative form, brief and informal in content. It shall be postmarked on or before the 15th day of the month succeeding the report period and shall contain:

a. A brief statement or description of over-all progress.

b. Description is to include all work whether yielding positive or negative results and be sufficient to establish validity of interpretation beyond reasonable doubt.

c. All pertinent sketches or drawings, calculations and theoretical analyses.

d. An indication of the work to be performed during the next period.

2. Fund Report. The Contractor shall also submit six (6) copies of a separate fund report to this Center, ATTN: M-P&C-CA, indicating the general status of funds assigned to this project and shall contain the following information:

a. Total amount authorized.

b. Total amount expended during the period. This would include obligations for special materials or supplies ordered solely for use under this Contract, and which could not be used for some other purpose.

c. Approximate total amount committed during the period.

d. Approximate total amount committed as of the end of the current reporting period.

e. Approximate uncommitted balance as of the end of the current reporting period.

3. Summary Report. Prior to completion or termination of the Contract, the Contractor shall prepare a Summary Report, in narrative form, containing the technical findings, conclusions, and recommendations made in connection with the work. The Summary Report shall also include design

principles, procedures, and methods of calculation that would be generally applicable to possible developments of these devices. The Contractor shall submit one copy of this report to the Contracting Officer for approval, postmarked within thirty (30) days following completion of research study. Upon approval by the Contracting Officer, six (6) copies of the report shall be submitted to this Center, ATTN: M-P&C-CA.

4. The above reports shall be submitted under a title page showing the following information:

a. Contractor's name and address, including segment generating the report.

b. Title of report, including period covered, when applicable.

c. Author(s)

d. Type of report, Contract number, and control number (e.g. TP 83-127).

e. Date of publication.

f. Prepared for George C. Marshall Space Flight Center, Huntsville, Alabama.

g. Include an abstract on all technical or scientific reports, when applicable.

5. All reports to George C. Marshall Space Flight Center shall be addressed as follows:

Director
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama
ATTN: M-P&C-CA.

ARTICLE II - PERIOD OF PERFORMANCE - DELIVERY

A. The work under this Contract shall be performed in accordance with the following schedule.

1. Government Furnished Property shipped to Contractor, F.O.B. Contractor's Plant, on or before August 15, 1961.

2. Work to commence on or before September 1, 1961.

3. Work to be completed on or before November 24, 1961.

B. Reports - As stated in Article I, D.

ARTICLE III - INSPECTION AND ACCEPTANCE

Inspection and Acceptance of any material and all reports shall be accomplished by personnel of M-G&C-N only.

ARTICLE IV - TECHNICAL SUPERVISION

All work shall be performed under the technical supervision of and in cooperation with the Contracting Officer or his duly authorized representative.

ARTICLE V - ESTIMATED COST AND FIXED FEE

The estimated cost of this Contract is $15,900.00 exclusive of the Contractor's fixed fee of $1,100.00. The total estimated cost and fixed fee is $17,000.00

ARTICLE VI - PAYMENT OF FIXED FEE

The fixed fee shall be payable on each invoice in the same proportion to the cost billed that the total fee bears to the total estimated cost of the Contract, which will not exceed that sum specified as Fixed Fee in Article V, and which is subject to the withholding provision of General Provision No. 4.

ARTICLE VII - GOVERNMENT FURNISHED PROPERTY

A. The Government reserves the right to furnish any equipment, material or supplies deemed necessary by the Contracting Officer for accomplishment of the work under this Contract.

B. The two (2) each Retractable Probe Type Angle of Attack Transducers, P/N 10000070, will be furnished F.O.B. the Contractor's Plant.

C. Upon completion of all testing, the Contractor is to request disposition instructions of the Contracting Officer.

ARTICLE VIII - OVERHEAD CEILINGS

The Government shall not be liable under this Contract for Indirect Costs in excess of the following rates:

Overhead----------	142% of Direct Labor.
Material Handling----------	30% of Material and Subcontract Cost.
Engineering Expense--------	17% of Direct Costs.
G&A Expense----------	27% of the Total of Direct Cost and Engineering Expense.

For the purpose of computing overhead rates, indirect costs incurred by the Contractor on other work prior to August 1, 1961, shall not be considered.

ARTICLE IX - GENERAL PROVISIONS

The General Provisions applicable to this Contract are contained in NASA Form 417 (6-61), which is attached hereto and made a part hereof.

ARTICLE X - CONTRACT INSTRUMENT

The parties executing this Contract agree that the Contract Instrument in its entirety consists of:

NASA Form 437	Title Page Index Page Schedule, consisting of Articles I through X as listed on the Index Page.
NASA Form 437-1	Signature Page
NASA Form 417 (6-61)	General Provisions 1 through 35

The Contractor represents that he ( ) has, (X) has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder (or contractor) to solicit or secure this contract; and that he ( ) has, (X) has not, paid or agreed to pay to any company or person (other than a full-time bona fide employee working solely for the bidder (or contractor) any fee, contingent upon or resulting from the award of this contract, and agrees to furnish information relating thereto as requested by the contracting officer. (NOTE: For interpretation of the representation, including the term "bona fide employee" see CODE OF FEDERAL REGULATIONS, TITLE 44, PART 150.)

IN WITNESS THEREOF, the parties hereto have executed this contract as of the day and year first above written:

THE UNITED STATES OF AMERICA

BY _____
(Signature)

_____
(Contracting Officer)

CONTRACTOR

U. S. Science Corporation
(Name of company or individual)

BY _____
(Signature)

Frederick J. Seufert
(Typed Name)

5221 West 102nd Street
Los Angeles 45, California
(Address)

II. Summary.

The following is a compendium of the test report numbers and the results of the tests in terms of "pass" or "fail", in accordance with the requirements of each test.

Test No.	Test	Report No.	SN 107	SN 113
1	Acceptance Tests	1	$Pass_1$	$Pass_1$
2	Dynamic Shock	2		$Pass_1$
3	Altitude Shock	3	$Pass_1$	
4	Vibration: Vertical Plane	4	$Pass_1$	
	Horizontal Plane	4	$Pass_1$	
	Lateral Plane	4	$Pass_{1,2}$	
5	Rain	5		$Pass_1$
6	Low Temperature Exposure	6	$Pass_{1,2}$	
7	Low Temperature Operation	7	$Pass_{1,2}$	
8	Acceleration	8		$Pass_1$
9	Humidity	9	$Fail_3$	
10	High Temperature Exposure	10	$Pass_{1,2}$	
11	High Temperature Operation	11	$Pass_{1,2}$	
12	Heater Element Endurance	12	$Pass_{1,2}$	
13	Salt Spray	13		$Pass_1$
14	Sand and Dust	14		$Pass_{1,2}$
15	Fungus	15	(Statement of Non-nutrients)	
16	Endurance	16	$Pass_{1,2}$	

Note 1. Refer to "Conclusions" section, Test Report No. 1
Note 2. Refer to "Conclusions" section, Test Report No. 4
Note 3. Refer to "Conclusions" section, Test Report No. 9

U. S. SCIENCE CORP.
5221 W. 102ND ST.
L.A. 45, CALIF.

TYPE SPEC.	SPEC. NO.	ISSUE	DATE
Production Test Procedure	PTP-12792-11	D	
SYSTEM	-13		
Angle of Attack Transducer	-15		

ENGINEERING SPECIFICATION	PREPARED BY	APPROVAL	APPROVAL	PAGE 1
	K. E. Lewis	K. E. Lewis	C. L. Chester	OF 9

PRODUCTION TEST
ANGLE OF ATTACK TRANSDUCER

1. Scope: This production test procedure covers the requirements for acceptance of the 12792-11 Angle of Attack Transducer.
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2. Requirements:

2.1 Equipment

2.1.1 Wheatstone bridge, (L & N 4725 or equivalent).
2.1.2 D.C. Galvanometer, (L & N 2310 or equivalent).
2.1.3 Megohmmeter, (General Radio 1862-B or equivalent).
2.1.4 Graphic Recorder (Sanborn 60 or equivalent).
2.1.5 Electrical Calibrator A/A Transducer, Topp P/N TT-14358.
2.1.6 Null Indicator, Topp P/N TT-16858.
2.1.7 Wind Tunnel, Topp 13184.
2.1.8 Leak Test Fixture, Topp P/N TT-18258.
2.1.9 Megohm Test Adapter, Topp P/N TT-16758-11.
2.1.10 Mechanical Dead Band Check Fixture, Topp P/N TT-16458.
2.1.11 Connecting Cable, Electrical Calibrator, Topp P/N TT-19058. (Use grip clamps until first assembly is made)

2.2 Examination of Product

*2.2.1 Examine each unit to determine that it meets requirements of workmanship, identification, finish and dimensional accuracy in accordance with drawing 12792-11 and its associated drawings.

2.3 Insulation Resistance

2.3.1 Plug the megger adapter II into the transducer plug.
2.3.2 Connect either side of the megger to the body of the transducer.
2.3.3 Connect the other side of the megger to the adapter.
2.3.4 Turn the megger ON.
*2.3.5 The resistance must be greater than 750 megohms.
2.3.6 Turn the megger OFF and disconnect.

2.4 Hook-Up

2.4.1 Connect the transducer to the tester with cable number II.
2.4.2 Connect the null indicator to the terminals on the tester as follows:

Tester	Null Indicator
Hi resistance Arm	Hi Arm
Lo 20	Lo

B. P.C. # 11-CP-CTEL-EE-15 ... C. INC. E.O. 9318 ... D. ADDED -15

-13
-15

2.4.3 Connect the L & N bridge to the bridge terminals.
2.4.4 Adjust the bridge per Tapp General Test Procedure GTP-LN4725 to read 1025 ohms.
2.4.5 Place the switches on the tester to the following positions:

SW 1	- Pos. 4	6	- OFF
SW 2	- Pos. 2	7	- OFF
SW 3	- Pos. 2	8	- OFF
SW 4	- Pos. 1	9	- ON
SW 5	- Pos. 1	Volt Adj	- 0

2.4.6 Set the wind tunnel pretractor to 0°.

2.5 Mechanical Dead Band

2.5.1 Install the transducer in the dead band test fixture.
2.5.2 Set the dekavider to .5000.
2.5.3 Turn the null indicator ON.
2.5.4 Rotate the test fixture until the meter nulls. (Approach the meter by rotating CW).
2.5.5 Note the dial reading.
2.5.6 Rotate the dial approximately 2° in the CW direction and then CCW to the noted dial reading.
*2.5.7 Adjust the dekavider to give a null on the meter.

2.5.7.1 The meter shall null between .4375 and .5025.

2.5.8 Turn the null indicator OFF.
2.5.9 Set the dekavider to .6500.
2.5.10 Rotate the dial 5° in the CW direction.
2.5.11 Turn the null indicator ON.
2.5.12 Rotate the dial CW until the meter nulls (do not ever run) and note the dial reading.
2.5.13 Rotate the dial in a CCW direction until the meter moves.
*2.5.14 The reading between step 2.5.12 and 2.5.13 shall not be more than 0.1°.
2.5.15 Turn the null indicator OFF.
2.5.16 Rotate the dial 10° in the CCW direction.
2.5.17 Set the dekavider to .3500.
2.5.18 Repeat steps 2.5.11 thru 2.5.15 by reversing the direction of rotation of the dial.
2.5.19 Remove the transducer from the dead band fixture.

2.6 Dynamic Response

2.6.1 Mount the transducer in the wind tunnel.
2.6.2 Connect the recorder to the SCOPE output terminals of the tester. (Do not have scope connected.)
2.6.3 Set the dekavider to .5000.
2.6.4 Turn the wind tunnel ON.

2.6.5 With the wind tunnel dynamic tester rotate the probe +2° and release.
2.6.6 Set the zero reference on the recorder.
2.6.7 With the wind tunnel dynamic tester rotate the probe -10°.
2.6.8 Turn the recorder to FAST.
2.6.9 Release the Probe.
*2.6.10 Measure the time required for 90% of the return value.
2.6.11 Turn the record OFF.
2.6.12 Repeat steps 2.6.7 thru 2.6.10 two more times.

2.6.12.1 The average of the three reads shall not exceed .20 seconds.

2.6.13 Disconnect the recorder leads from the tester.

2.7 Preliminary Dead Band

2.7.1 Connect the null indicator meter leads to the SCOPE terminals.
2.7.2 Set the dekavider to .5000.
2.7.3 Turn the wind tunnel ON.
2.7.4 Turn the null indicator ON.
2.7.5 Rotate the wind tunnel index to 0° from the negative direction without overshooting zero.
*2.7.6 Null the meter by adjusting the dekavider.
2.7.7 Rotate the wind tunnel index to +4° and back to zero degrees without overshooting zero.
2.7.8 Null the meter by adjusting the dekavider.
*2.7.9 The dekavider readings of step 2.7.6 and 2.7.8 shall not differ by more than .0050.
2.7.10 Turn the null indicator OFF.
2.7.11 Disconnect the null indicator meter leads from the tester.

2.8 Noise Test

2.8.1 Connect the oscilloscope to the SCOPE terminals.
2.8.2 Calibrate the scope with the internal calibrator for 100 mill-volts indication.
2.8.3 Change SW 1 to POS 2.
2.8.4 Rotate the wind tunnel dial thru +20° to -20° at about 50° per minute.
*2.8.5 The noise spikes must not be more than 100 mv. (Pot A)
2.8.6 Change SW 3 to POS 3. (This checks Pot B).
2.8.7 Repeat steps 2.7.4 and 2.7.5.
2.8.8 Disconnect the scope leads from the SCOPE terminals.

2.9 Electrical, Mechanical, Aerodynamic Zero

2.9.1 Connect the null indicator meter leads to the SCOPE terminals.
2.9.2 Loosen the screws holding the pots on the transmitter so they can be moved.

2.9.3 Set the null indicator to .5000.
2.9.4 Set the wind tunnel protractor to 0°.
2.9.5 Change SW 1 to POS 4.
2.9.6 Turn the null indicator ON.
2.9.7 Slide the 1025 ohm pot (pot B - 2 taps) until a null is obtained on the indicator. (Slider must be between the two taps.)
2.9.8 Tighten the screws on the B pot.
*2.9.9 Zero the null meter by changing the dekavider if unable to accomplish a zero in step 2.9.7.

2.9.9.1 The meter shall zero between .4850 and .5150.

2.9.10 Change SW 3 to POS 2.
2.9.11 Set the null meter to .5000.
2.9.12 Slide the 1900 ohm pot (pot A) until a null is obtained on the indicator.
2.9.13 Repeat steps 2.9.8 and 2.9.9 for pot A.

2.9.13.1 The meter shall zero between .4975 and .5025.

2.9.14 Turn the null indicator OFF.

2.10 Electrical Length

2.10.1 Rotate the wind tunnel protractor to +19.9°.
2.10.2 Set the dekavider to .9975.
2.10.3 Turn the null indicator ON.
*2.10.4 Rotate the protractor on the tunnel until a null is obtained.

2.10.4.1 The null shall fall between +19.8° and +20.0°.

2.10.5 Turn the null indicator OFF.
2.10.6 Rotate the wind tunnel protractor to -19.9°.
2.10.7 Set the dekavider to .0025.
2.10.8 Turn the null indicator ON.
*2.10.9 Rotate the protractor on the tunnel until a null is obtained.

2.10.9.1 The null shall fall between -19.8° and -20.0°.

2.10.10 Turn the null indicator OFF.
2.10.11 Change SW 3 to POS 3.
2.10.12 Set the dekavider to .0150.
2.10.13 Rotate the wind tunnel protractor to -9.9°.
2.10.14 Turn the null indicator ON.
*2.10.15 Rotate the protractor on the tunnel until a null is obtained.

2.10.15.1 The null shall fall between -9.8° and -10.0°.

2.10.16 Turn the null indicator OFF.

-13
-15

2.10.17 Rotate the wind tunnel protractor to +9.9°.
2.10.18 Set the dekavider to .9850.
2.10.19 Turn the null indicator ON.
*2.10.20 Rotate the protractor on the tunnel until a null is obtained.

2.10.20.1 The null shall fall between +9.8° and +10.0°.

2.10.21 Turn the null indicator OFF.
2.10.22 Turn the wind tunnel OFF.

2.11 Total Resistance

2.11.1 Rotate the probe so that the slider is outside the end tap.
2.11.2 Change SW 1 to POS 3.
*2.11.3 Measure the resistance of pot B by nulling the galvanometer with the Wheatstone Bridge.

2.11.3.1 The galvanometer shall null between 975 and 1075 ohms.

2.11.4 Change SW 3 to POS 2.
2.11.5 Adjust the bridge to read 1900 ohms.
*2.11.6 Measure the resistance of pot A by nulling the galvanometer.

2.11.6.1 The galvanometer shall null between 1805 and 1995 ohms.

2.12 Taps, Linearity, and Dead Band

2.12.1 Connect the scope to the SCOPE terminals.
2.12.2 Change SW 1 to POS 5.
2.12.3 Change SW 3 to POS 5.
2.12.4 Turn the wind tunnel ON.
2.12.5 Rotate the wind tunnel to -3.3°.
*2.12.6 Adjust the wind tunnel until a null appears on the scope.

2.12.6.1 The null shall appear between -3.27° and -3.39°.

2.12.7 Change SW 3 to POS 6.
2.12.8 Repeat steps 2.12.5 thru 2.12.6.1 for +3.33°.
2.12.9 Rotate the wind tunnel to -21° and back to 0.1° inside the tap.
2.12.10 Change SW #1 to POS 4.
2.12.11 Change SW #3 to POS 2.
2.12.12 Set the dekavider between the values on Chart 1, Pot A.
2.12.13 Turn the null indicator ON.
*2.12.14 Null the meter by adjusting the dekavider.

2.12.14.1 The meter shall null within the limits given in Chart 1. (See note on chart.)

2.12.15 Turn the null indicator OFF.

-13
-15

2.12.16 Repeat the procedure of nulling the meter in steps 2.12.12 thru 2.12.15 for all angles listed in Chart 1, Pot A.
2.12.17 Rotate the wind tunnel back to +18° without overshooting.
2.12.18 Set the dekavider to the value at which the meter had nulled at +18°.
2.12.19 Turn the null indicator ON.
*2.12.20 Null the meter by adjusting the dekavider.

2.12.20.1 The meter shall null within 50 divisions of the previous value for the given angle.

2.12.21 Repeat the procedure of nulling the meter in steps 2.12.15 thru 2.12.20 for 0.0° and -18.0°.
2.12.22 Change SW 3 to POS 3.
2.12.23 Rotate the wind tunnel to -11° and back to 0.1° inside the tap.
2.12.24 Repeat the procedure of nulling the meter in steps 2.12.12 to 2.12.15 for all angles listed in Chart 1, Pot B.
2.12.25 Turn the wind tunnel OFF.

2.13 Mechanical Stops

2.13.1 Remove the transducer from the wind tunnel. (Leave the cable connected to the tester.)
2.13.2 Change SW 3 to POS 2.
2.13.3 Set the dekavider to .0025.
2.13.4 Turn the null indicator ON.
2.13.5 Rotate the probe counter-clockwise until a null appears on the meter. (Dekavider can be changed ±.0025 to get null.)
*2.13.6 Adjust the end stop screws against the slider arm.
2.13.7 Turn the null indicator OFF.
2.13.8 Set the dekavider to .9975.
2.13.9 Repeat steps 2.13.4 thru 2.13.7 in the clockwise direction.
2.13.10 Disconnect the transducer from the tester cable.

2.14 Pressure Test

2.14.1 Position "O" ring on open side of housing.
2.14.2 Position cover and screws down tight.
2.14.3 Apply grease to both surfaces of rubber gasket on leak test fixture and position on locating pins of housing.
2.14.4 Position unit on vacuum jar with rubber gasket between unit and jar.
2.14.5 Turn switch on right to OFF and switch on left to ON.
2.14.6 Plug motor cable in bench outlet
2.14.7 When mercury reaches .3" remove motor cable from outlet and turn switch on left to OFF.
*2.14.8 Let stand for 3 minutes and read mercury. Drop should not be more than 1".
2.14.9 Turn both switches to ON position.
2.14.10 Remove unit and remove grease from flange.

*Requires entry on data sheet. The unit may be tapped or vibrated per MIL-T-7785A, Paragraph 4.5.3, before a test reading is taken.

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CHART I

12792-11

POT A

Wind Tunnel Tap		Degree	Dekavider Lin. Min.	Read	Max.
-20.0°	+0.1	= -19.9	.0000	____	.0050
	+0.2	= -19.8	.0025	____	.0075
	+0.3	= -19.7	.0050	____	.0100
		-14.0	.1475	____	.1525
		- 7.0	.3225	____	.3275
		- 0.3	.4900	____	.4950
		- 0.2	.4925	____	.4975
		- 0.1	.4950	____	.5000
		0.0	.4975	____	.5025
		+ 0.1	.5000	____	.5050
		+ 0.2	.5025	____	.5075
		+ 0.3	.5050	____	.5100
		+ 7.0	.6725	____	.6775
		+14.0	.8475	____	.8525
+20.0	-0.3	= +19.7	.9900	____	.9950
	-0.2	= +19.8	.9925	____	.9975
	-0.1	= +19.9	.9950	____	.9999

POT B

Wind Tunnel Tap		Degree	Dekavider Lin. Min.	Read	Max.
-10.0°	+0.1	= -9.9	.0000	____	.0300
	+0.2	= -9.8	.0150	____	.0450
	+0.3	= -9.7	.0300	____	.0600
		-7.0	.4350	____	.4650
		-4.0	.8850	____	.9150
- ____	-0.3	= -___	.9400	____	.9700
	-0.2	= -___	.9550	____	.9850
	-0.1	= -___	.9700	____	.9999
	+0.1	= -___	.9700	____	.9999
	+0.2	= -___	.9550	____	.9850
	+0.3	= -___	.9400	____	.9700
		-2.0	.7850	____	.8150
		-0.3	.5300	____	.5600
		-0.2	.5150	____	.5450
		-0.1	.5000	____	.5300
		0.0	.4850	____	.5150
		+0.1	.4700	____	.5000
		+0.2	.4550	____	.4850
		+0.3	.4400	____	.4700
		+2.0	.1850	____	.2150
+ ____	-0.3	= +___	.0300	____	.0600
	-0.2	= +___	.0150	____	.0450
	-0.1	= +___	.0000	____	.0300
	+0.1	= +___	.0000	____	.0300
	+0.2	= +___	.0150	____	.0450
	+0.3	= +___	.0300	____	.0600
		+4.0	.0850	____	.1150
		+7.0	.5350	____	.5650
	-0.3	= +9.7	.9400	____	.9700
	-0.2	= +9.8	.9550	____	.9850
+10.0	-0.1	= +9.9	.9700	____	.9999

Deadband Read Dekavider

0.0		+4.0°
	=	
____		____ ±.0050

NOTE: If the readings are out of tolerance, the difference may be caused by the electrical length of the pot not being 50° but still within ±.2°. In this case, it will be necessary to recalculate the limits.

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ACCEPTANCE TEST DATA
ANGLE OF ATTACK TRANSDUCER
Model #12792-11

Date _____

S/N _____ Body # _____

1. Examination of Product (Check only if acceptable)

Workmanship _____
Identification _____
Finish _____
Dimensional
Accuracy _____

2. Insulation Test

_____ Megohms (Min. 750 megohms)

3. Dynamic Response

_____ Sec.
_____ Sec.
_____ Sec.

AVERAGE _____ Sec.
(Max. .20 Sec.)

TOTAL _____ Sec.

4. Mechanical Dead Band

	Dekavider		
Center	.5000	=	_____ ±.0025
CW	.6500		_____ .1° max.
CCW	.3500		_____ .1° max.

5. Preliminary Dead Band

Dekavider

0.0°. +4.0°

=

_____ _____ ±.0050

-15

6. **Noise Test**

Pot A (1900 ohms) _____ 100 mv max (+20° to -20°)
Pot B (9200 ohms) _____ 100 mv max (+20° to -20°)

7. **Electrical, Mechanical, Aerodynamic Zero**

	Min.	Read	Max.
Pot B	.4850	_____	.5150
Pot A	.4975	_____	.5025

8. **Electrical Length**

	Dekavider	Min.	Protractor Read	Max.
Pot A	(1) .9975	+19.8°	_____	+20.0°
	(2) .0025	-19.8°	_____	-20.0°
Pot B	(1) .0150	- 9.8°	_____	-10.0°
	(2) .9850	+ 9.8°	_____	+10.0°

9. **Total Resistance**

	Min.	Read	Max.
Pot B	975	_____	1075
Pot A	1805	_____	1995

10. **Linearity and Dead Band** (See Page 10)

11. **Mechanical Stops**

Dekavider

Min.	Read	Max.
.0000	_____	.0050
.9950	_____	.9999

12. **Pressure Test**

Time	Max.	Read	Min.
5 minutes	.3 in.	_____	1.3 in.

UNIT ACCEPTABLE _____

UNIT UNACCEPTABLE _____

Reasons Unacceptable:

Corrected: _____

INSPECTION TEST PROCEDURE

RETRACTABLE PROBE TYPE ANGLE OF ATTACK TRANSDUCER

1. This inspection test procedure covers the requirements for acceptance of the 19600 Retractable Probe Type Angle of Attack Transducer

2. Equipment - Static

   2.1 60 Volt DC Power supply 5 amp

   2.2 Adjustable air supply 90 to 110 lbs.

3. Equipment - Dynamic

   3.1 Chrysler wind tunnel and test set.

   3.2 Stop watch

4. Pre Test

   4.1 Ensure that all previous inspection stages have been completed.

5. Preliminary steps to use of Test Equipment.

   5.1 Mount unit securely on wind tunnel.

      5.1.1 Connect cables to unit.

   5.2 Turn on all power switches (115V 60 ~, 115 V 400~ 3θ, 60 vdc, 28 vdc).

      5.2.1 Power Light on consol will come on only if all power sources are present. Ensure that it is lit during complete test.

   5.3 Extend Probe by pushing Toggle Switch to extend position. Ensure that extend light operates.

   5.4 Rotate selector switch to Insulation Resistance position.

   5.5 Turn blower switch on and rotate variac CW until air speed is maintained at 150 knots.

   5.6 Place Zero-Read switch, under meter, to zero position and adjust for zero with Zero Adjust pot. Do not adjust again during test.

6. Megger Test.

6.1 Rotate Zero-Read switch to Read. Meter must indicate on green portion of Insulation Resistance scale.

6.1.1 Press Insulation Resistance Verify button, this causes meter to deflect to Right hand edge of Red and return to Green Area.

6.1.2 Stamp data sheet in space provided if unit is acceptable.

7. Aerodynamic Zero Test.

7.1 Rotate Test selector to Linearity position.

7.2 Remove locating pin from fly wheel and place through forcing arm to actuate zero position switch on scale plate. The meter should deflect towards zero.

7.3 Adjust Zero Positioner knob for zero on meter. If zero on the meter can be adjusted the probe zero is within ± .25° of the pot center. Do not adjust this again during test.

7.4 Stamp data sheet in space provided if unit is acceptable.

8. Linearity Test.

8.1 Remove locating pin from zero position and move to +14° position in order to actuate switch. Meter indicates in green portion of linearity scale.

8.2 Repeat the above Test except using +7°, -7°, -14° positions. The meter must indicate in the green portion of the linearity scale in each case.

8.3 Stamp data sheet in spaces provided if the test results are acceptable.

9. Extend and Retract.

9.1 Using a stop watch measure the time that is required for the probe to retract. The completion of the retraction is indicated by the Retract light when it goes on.

9.2 Repeat the above except using the Extend light.

9.3 The maximum time is 15 seconds for one extension or one retraction.

9.4 Stamp data sheet if unit is acceptable.

10. Phase Lag Test.

10.1 Place locating pin and forcing arm in 2° position on fly wheel.

10.2 Place test selector switch in Phase Lag position.

10.3 Place Mechanical Oscillator switch to ON.

10.4 Meter must indicate in the green portion on the phase scale.

10.4.1 Turn off mechanical oscillator.

10.5 Stamp data sheet in space provided if unit is acceptable.

10.6 If a quantitative measurement is desired repeat steps 10.1 thru 10.3.

10.6.1 While unit is rotating loosen holding screws on back of rotary switch.

10.6.2 Adjust switch until meter reads zero.

10.6.3 Read the degree of Phase Lag on switch.

10.6.4 Return switch to 15° mark after completion of test.

10.6.5 Tighten holding screws.

10.6.6 Turn off mechanical oscillator.

11. Noise Test.

11.1 Place locating pin and forcing arm in 20° position on fly wheel.

11.2 Rotate test selector to Pot Noise position.

11.3 Place Test/Verify switch in Verify position.

11.3.1 Failure lamp flashes on, off, on-test ok lamp flashes on, off.

11.4 Place Mechanical Oscillator switch on.

11.5 Slowly place Test/Verify switch in Test position.

11.5.1 If after approximately five complete revolutions the Test OK lamp is still on the unit is acceptable, but if the Failure lamp should go on during the test the unit should be rejected.

11.6 Turn off Mechanical Oscillator switch.

11.7 Stamp data sheet in space provided if unit is acceptable.

12. Air Jet Calibration.

12.1 Place locating pin in zero position scale plate but do not actuate switch.

12.2 Place Retract/Extend switch in retract position to retract probe.

12.3 Rotate variac control ccw until air speed is zero then turn off switch.

12.4 Return Test Selector to Linearity position.

12.5 Connect air hoses to unit.

12.6 Place Air Command switch in + position and adjust regulator until air pressure stabilizes at 110 lbs.

12.6.1 Meter must indicate between zero and full scale on left side.

12.6.2 Repeat above steps for 90 lbs. and 100 lbs.

12.7 Place Air Command switch in - position and adjust regulator until air pressure stabilizes at 110 lbs.

12.7.1 Meter must indicate between zero and full scale on right side.

12.7.2 Repeat above steps for 90 lbs. and 100 lbs.

12.8 Stamp data sheet in space provided if unit is acceptable.

12.9 Turn off all power switches and remove unit from test fixture.

13. Heater Test.

13.1 Place unit on bench and connect cable to J1.

13.2 Extend Probe by placing Retract/Extend switch in Extent position.

13.3 Clamp thermometer thermocouple to probe 1/4 inch from front face of Retractable Probe Housing. (DANGER - Probe may still be too hot to touch.)

13.4 Apply +28 v to pins J and K of J2. Pins G & H is ground or -28V

13.4.1 Connect ammeter in series with Pins J & K to monitor heater current. When ammeter shows approximately 5 amps heater is on.
Caution: Do not actuate heater for more than 30 seconds in still air.

13.5 Stamp Data Sheet in spaces provided if unit is acceptable.

14. Leak Test.

14.1 Place unit in fixture making sure to allign dowel pins before tightening.

14.2 Tighten clamps securely.

14.2.1 Remove all tape from bottom of unit.

14.3 Apply pressure then close valve so that a pressure of 15 PSIG is maintained inside test chamber.

14.4 Start Clock.

14.5 Pressure must not drop more than 1.5 PSIG after 10 minutes.

14.6 Stamp data sheet in space provided if unit is acceptable.

DATA SHEET
17409

DATE _____

S/N _____

TEST	INSTRUCTIONS	STAMP
1. Megger	(Green portion of insulation resistance scale)	acc _____
2. Zero	(Meter can be zeroed)	acc _____
3. Linearity	(Green portion of linearity scale)	+14° acc _____ + 7° acc _____ - 7° acc _____ -14° acc _____
4. Extend	(Maximum 15 seconds)	acc _____
Retract	(Maximum 15 seconds)	acc _____
5. Phase Lag	(15° maximum)	acc _____
6. Noise	(Test ok lamp remains on)	acc _____
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs. acc _____ 100 lbs. acc _____ 110 lbs. acc _____
	- (Meter deflects to right of zero but on scale)	90 lbs. acc _____ 100 lbs. acc _____ 110 lbs. acc _____
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°) ("on" when extended-"off" when retracted)	acc _____ acc _____
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)	acc _____ acc _____

NOTES:

_____

_____ Tester

_____

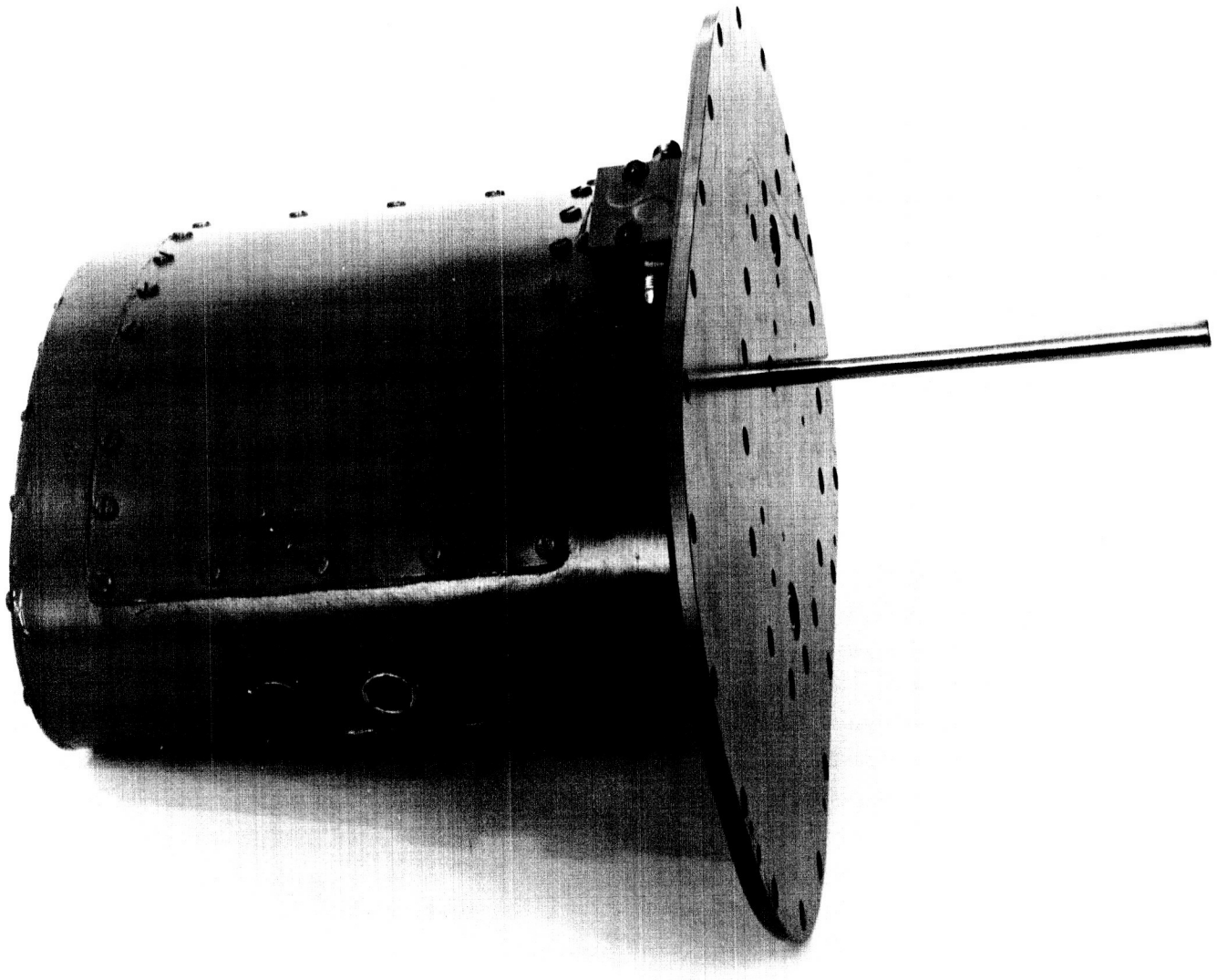


FIGURE A. RETRACTABLE PROBE, PART NO. 10000070

H. YURAK PHOTOS
NO 129
SAN PEDRO - TE 2-0142

TEST SPECIFICATIONS

1. ACCEPTANCE INSPECTION AND TEST: THE ASSEMBLED COMPONENTS MUST BE INSPECTED FOR COMPLIANCE WITH DRAWING GOOD WORKMANSHIP AND THE FOLLOWING TESTS AS DETERMINED IN A SUBSONIC TUNNEL AT 90 KNOTS ± 5% WIND VELOCITY.

2. INSULATION RESISTANCE: THE INSULATION RESISTANCE SHALL BE A MINIMUM OF 5 MEGOHMS WHEN A 500 VDC POTENTIAL IS APPLIED BETWEEN THE CONNECTOR CONNECTOR PINS AND THE HOUSING ELECTRICALLY CONNECTED TO THE CASE IN CONNECTOR PLUG.

3. POTENTIOMETER NOISE: THE CONTACT RESISTANCE BETWEEN THE WINDINGS OF THE TRANSDUCER OUTPUT POTENTIOMETER AND ITS WIPER SHALL NOT EXCEED 200 OHMS MEASURED WHILE SWEEPING THE POTENTIOMETER AT 20 DEGREES PER SECOND FOR 2 CYCLES AS MEASURED ON THE "A" POT.

4. AERODYNAMIC ZERO: THE AERODYNAMIC ZERO SHALL AGREE WITH THE ELECTRICAL ZERO WITHIN ± 0.5 DEGREES AS MEASURED ON THE "A" POT.

5. ROTATION: LOOKING AT THE END OF THE PROBE CLOCKWISE ROTATION OF THE PROBE SHALL MOVE WIPER "B" TOWARD TERMINAL "G" AND WIPER "E" TOWARD TERMINAL "F" ON PLUG J2.

6. PRESSURE DROP: AFTER INITIAL PRESSURIZATION OF 5 PSIG WITH THE UNIT MOUNTED IN A CONTAINER OF 240 ± 1% CU IN DIFFERENTIAL VOLUME WITH THE TRANSDUCER INSTALLED THE PRESSURE DROP SHALL NOT BE MORE THAN 1.5 PSIG IN 10 MIN.

AERODYNAMIC LINEARITY: THE AERODYNAMIC LINEARITY SHALL BE WITHIN ± 0.5 DEGREES WITH THE ZERO SHIFT REMOVED AND SHALL BE LINEAR FROM -17 AND +17 DEGREES AND +AND- 14 DEGREES AND 0 DEGREE AS DETERMINED ON THE "A" POT.

7. HEATER: ELECTRICAL WITH A SINUSOIDAL TRACKING FUNCTION OF 115 VAC AND AN AMP. TUBE OF 1.5 DEGREES THE PHASE LAG OF THE TRANSDUCER SHALL NOT EXCEED 15 DEGREES WITH HEATER OFF.

8. AIR JET CALIBRATION: THE AERODYNAMIC ALIGNMENT TO THE AIR JETS SHALL BE IN 3 DEGREES WITH AN AIR PRESSURE OF 90 PSI AND 10 PSIG AS MEASURED WHEN UNBLEED FOR 4 SEC. FLOW, AND THE READING TAKEN AT PRESSURE OFF.

9. EXTEND/RETRACT: THE TRANSDUCER SHALL EXTEND IN LESS THAN 15 SEC AND RETRACT IN LESS THAN 15 SEC WITH 28 VDC APPLIED. FAILURE TO COMPLY WITH THESE LIMITS AND NOTES WILL BE CAUSE FOR REJECTION. U.S. SCIENCE CORP. SHALL SUPPLY CALIBRATION AND TEST DATA BASED ON TESTS PERFORMED WITH EACH TRANSDUCER.

10. CONTINUITY: THERE SHALL BE NO ELECTRICAL DISCONTINUITY IN THE CONTROL POTENTIOMETER OF THE TRANSDUCER DURING A FULL CLOCKWISE AND A FULL COUNTERCLOCKWISE ROTATION AS DEFINED BY THE MECHANICAL STOPS.

11. TIMING: ON EXTENDING AND RETRACTING ONLY WITH THE PROBE FULLY EXTENDED THERE SHALL BE CONTINUITY BETWEEN PINS "C" AND "D" OF PLUG J2. WITH THE PROBE FULLY RETRACTED THERE SHALL BE CONTINUITY BETWEEN PINS "A" AND "B" OF PLUG J2. WHEN THE PROBE IS EITHER ONLY EXTENDED NOR RETRACTED THERE SHALL BE NO CONTINUITY BETWEEN THE PINS.

12. PROBE HEATER: THE PROBE SHOULD NOT BE FIRED FOR ANY LONGER THAN 30 SECONDS MAX.

DESIGN CONTROL SPECIFICATIONS

1. RANGE: THE TRANSDUCER RANGE IS + AND- 30 DEGREES ± 0.2 DEGREES WITH DUAL POT OUTPUT.

2. POTENTIOMETER NOISE: THE CONTACT RESISTANCE BETWEEN THE WINDINGS OF THE TRANSDUCER OUTPUT POTENTIOMETER AND ITS WIPER SHALL NOT EXCEED 200 OHMS MEASURED WHILE SWEEPING THE POTENTIOMETER + AND 20 DEGREES AT DATE CPS FOR 2 CPS AS MEASURED ON THE "A" POT.

3. POTENTIOMETER CHARACTERISTICS: (A) 1500 OHMS ± 5% LINEARITY 0.2% CONTINUOUS LIFE OF 50 HOURS AT 30 MILLIAMPERES WITH 6 MILLIAMPERES THRU THE WIPER AND 30 MILLIAMPERES THRU THE POTENTIOMETER WINDING WITH 60 VDC APPLIED AND AT AMBIENT OF 30°F (B) A TAPPED POTENTIOMETER WITH 3 EQUAL SEGMENTS, 1000 OHMS ± 5% PER SEGMENT LINEARITY BETWEEN TAPS 0.25% 25 MILLIAMPERES WITH 50 VDC CONTINUOUS OPERATION. TOTAL RES. 3000 OHMS ± 5% MECHANICAL OVERTRAVEL OF THE WIPER SHALL NOT CAUSE ELECTRICAL DISCONTINUITY.

4. ORIENTATION: ALL AERODYNAMIC CALIBRATION DATA WILL BE IN REF. TO THE 3/4 IN DOWEL HOLES ON THE MOUNTING SURFACE.

5. VIBRATION: THE INSTRUMENT SHALL FUNCTION PROPERLY UNDER THE FOLLOWING CONDITIONS: 10 TO 55 CPS AT .06 IN DOUBLE AMPLITUDE 55 TO 1500 CPS AT 5 GS. VIBRATION TEST AND TRANSDUCER ACCURACY UNDER VIBRATION WILL ONLY BE REQUIRED ON A SAMPLING BASIS DETERMINED BY THE PROCURING ACTIVITY.

6. CALIBRATION DATA: THREE GRAPHIC PLOTS OF DATA TAKEN AT 0.1 DEGREE INTERVALS FOR 0.5 DEGREES EITHER SIDE OF THE NULL LOCATION PLUS 1.0 DEGREE INTERVALS FOR THE BALANCE OF THE RANGE, SHALL BE PROVIDED USING A MINIMUM SCALE OF 1 DEGREE PER INCH. THIS CALIBRATION SHALL ONLY BE REQUIRED ON A SAMPLING BASIS DETERMINED BY THE PROCURING ACTIVITY. CALIBRATION DATA SHALL BE AT +AND-14 DEGREES ± 4 AND -7 DEGREES ± 0.1 ON ALL TRANSDUCERS.

7. AERODYNAMIC LOADING OF PROBE: THE TRANSDUCER SHALL FUNCTION SATISFACTORILY WITHIN STATED ACCURACY WITH AERODYNAMIC LOADS UP TO 30 LBS. THIS TEST SHALL BE CONSIDERED A QUALIFICATION TEST AND SHALL BE PERFORMED AT THE REQUEST OF THE PROCURING ACTIVITY.

8. AERODYNAMIC ZERO: THE AERODYNAMIC ZERO SHALL AGREE WITH THE ELECTRICAL ZERO WITHIN 2 DEG AS MEASURED ON THE "A" POT, WHEN TESTED IN SUBSONIC TUNNEL AT 150 KNOTS 25% WIND VELOCITY.

9. MECHANICAL RANGE: THE TOTAL MECHANICAL RANGE SHALL NOT BE LESS THAN THE TOTAL ELECTRICAL RANGE BY MORE THAN 0.5°.

10. POLARITY: LOOKING AT THE END OF THE PROBE CLOCKWISE ROTATION OF THE PROBE SHALL MOVE WIPER "B" TOWARD TERMINAL "G" AND WIPER "E" TOWARD TERMINAL "F" ON PLUG J2.

11. DRAWING: THIS DRAWING SHALL BE USED FOR PROCUREMENT OF THIS ASSEMBLED COMPONENT.

12. CALIBRATION JETS: THE CALIBRATION AIR JETS SHALL BE SET FOR + AND -14 AND SHALL BE ACCURATE TO ± 1° AT TEST PRESSURE OF 90, 100 AND 110 PSIG WITH A PRESSURE TOLERANCE OF ± 1 PSIG MEASURED AT THE NOZZLE BLOCK.

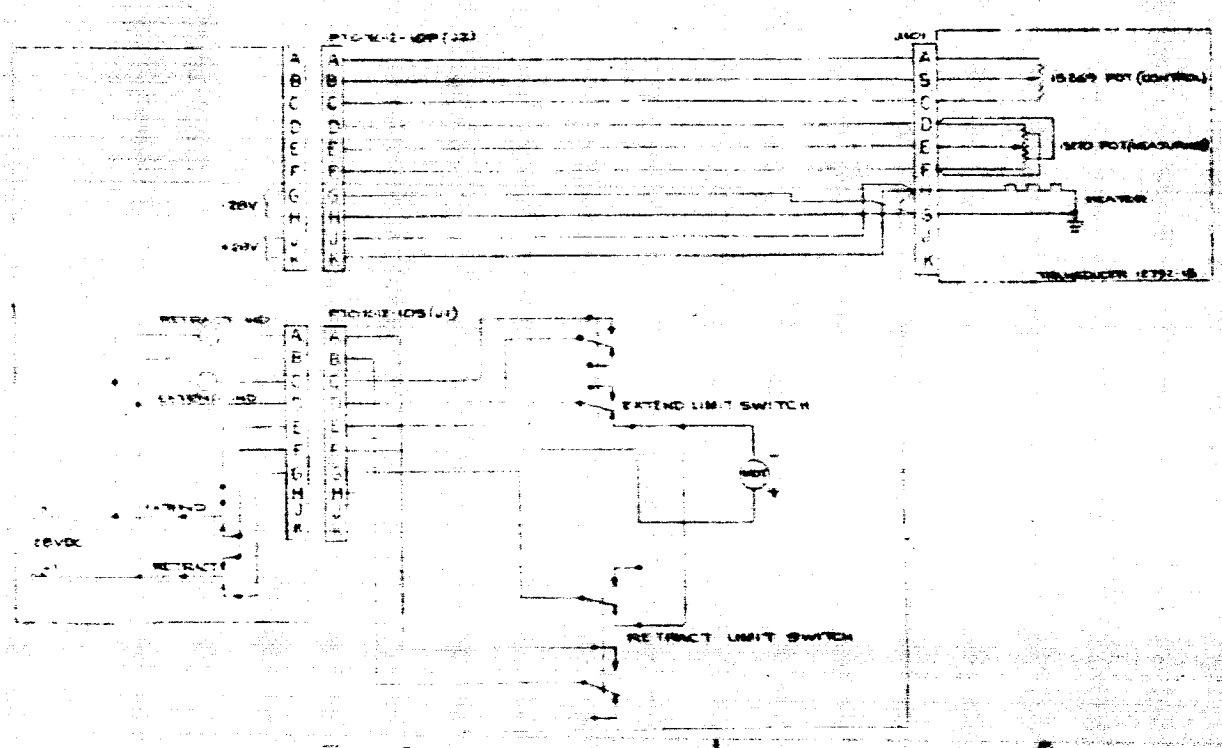
13. EXTEND AND RETRACT: THE TRANSDUCER SHALL EXTEND IN LESS THAN 15 SEC AND RETRACT IN LESS THAN 15 SEC UNDER [illegible]

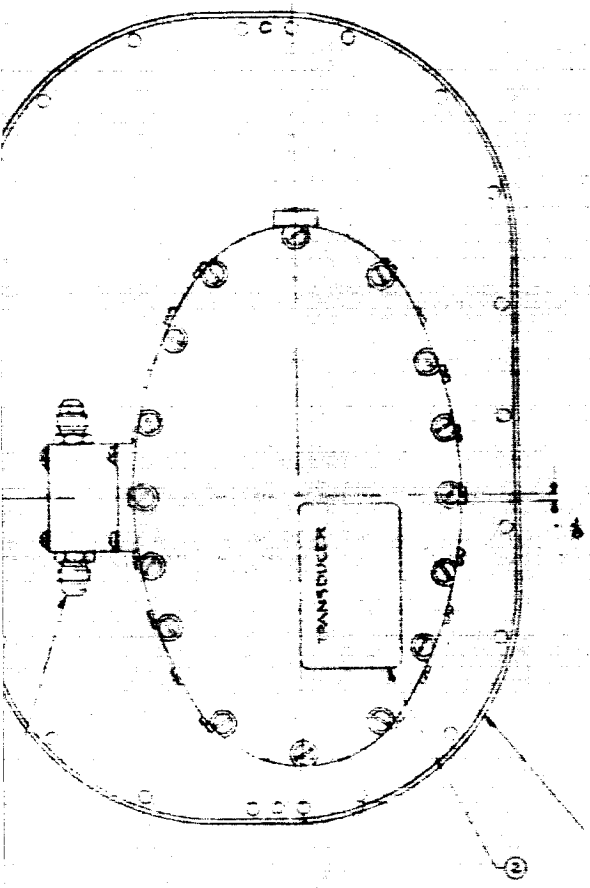
14. PRESSURE DROP: AFTER INITIAL PRESSURIZATION OF 5 PSIG WITH THE UNIT MOUNTED IN A CONTAINER OF 240 ± 1% CU IN DIFFERENTIAL VOLUME WITH THE TRANSDUCER INSTALLED THE PRESSURE DROP SHALL NOT BE MORE THAN 1.5 PSIG IN 10 MIN.

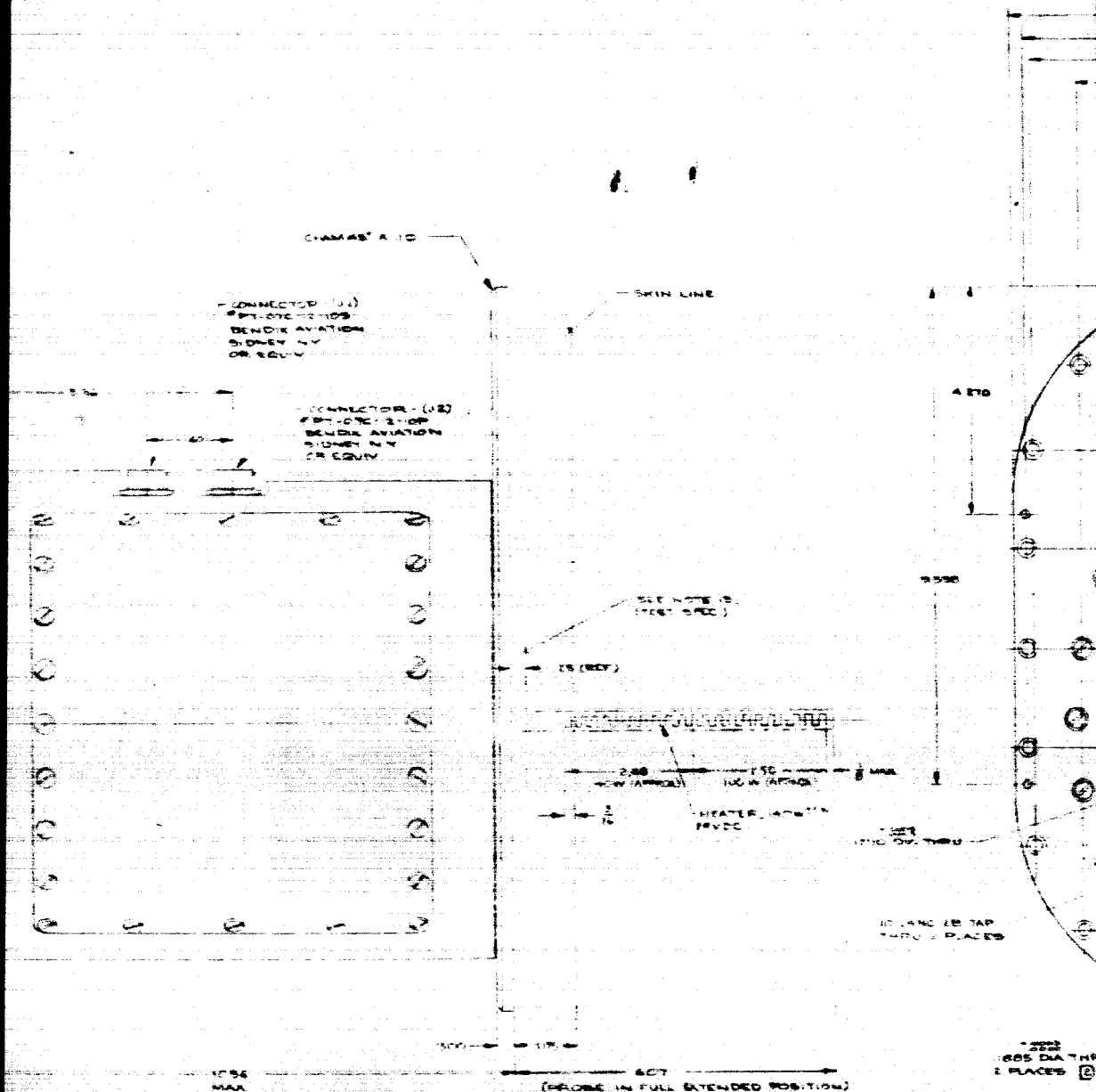
15. WEIGHT: TOTAL WEIGHT SHALL NOT EXCEED 11 LBS.

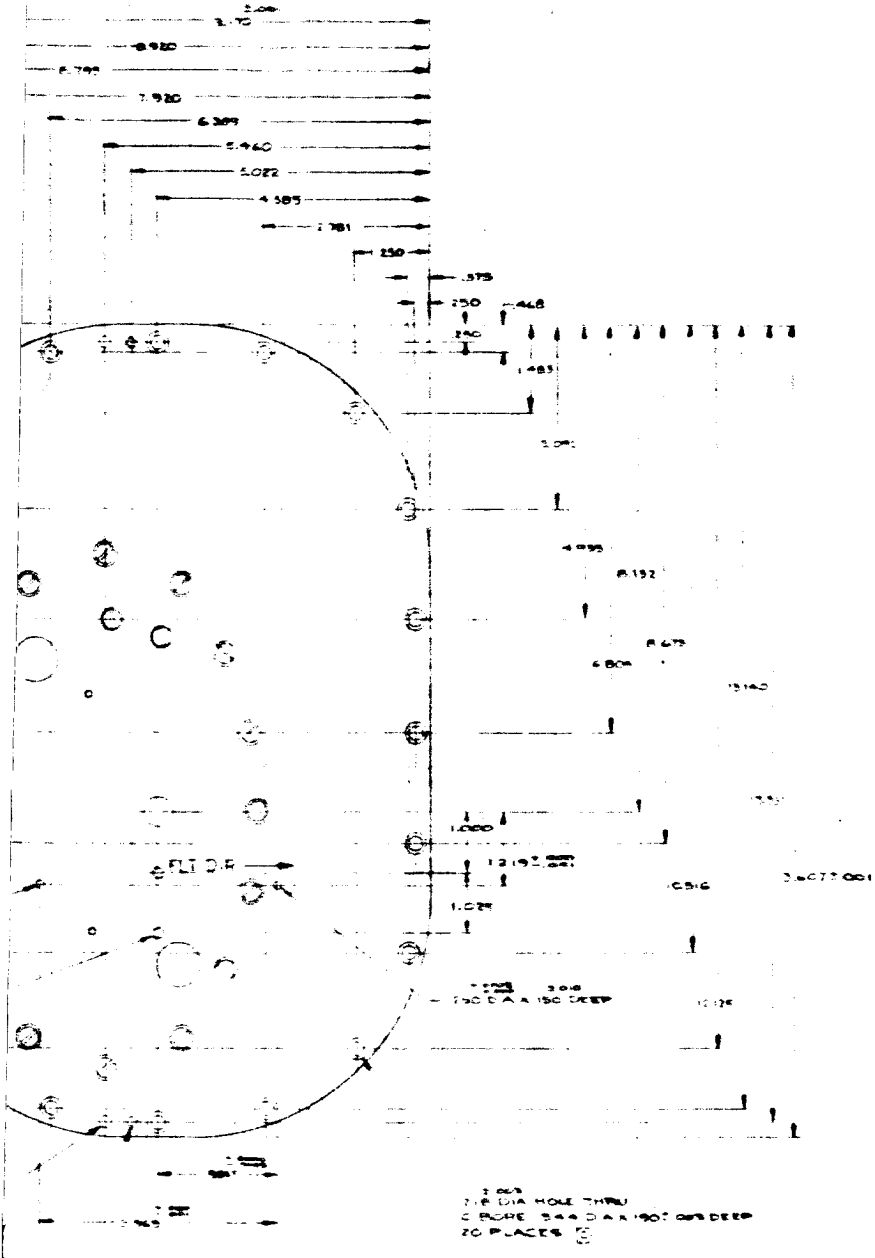
16. AERODYNAMIC ACCURACY: THE AERODYNAMIC ALIGNMENT SHALL BE WITHIN ± 0.5 DEGREES OVER WIND VELOCITIES MACH 0.2 TO MACH 0.28 THIS TEST SHALL BE CONSIDERED A QUALIFICATION TEST AND SHALL BE PERFORMED AT THE REQUEST OF THE PROCURING ACTIVITY.

17. PROBE HEATER: THE PROBE SHOULD NOT BE FIRED FOR ANY LONGER THAN 30 SECONDS MAX.




TRANSDUCER

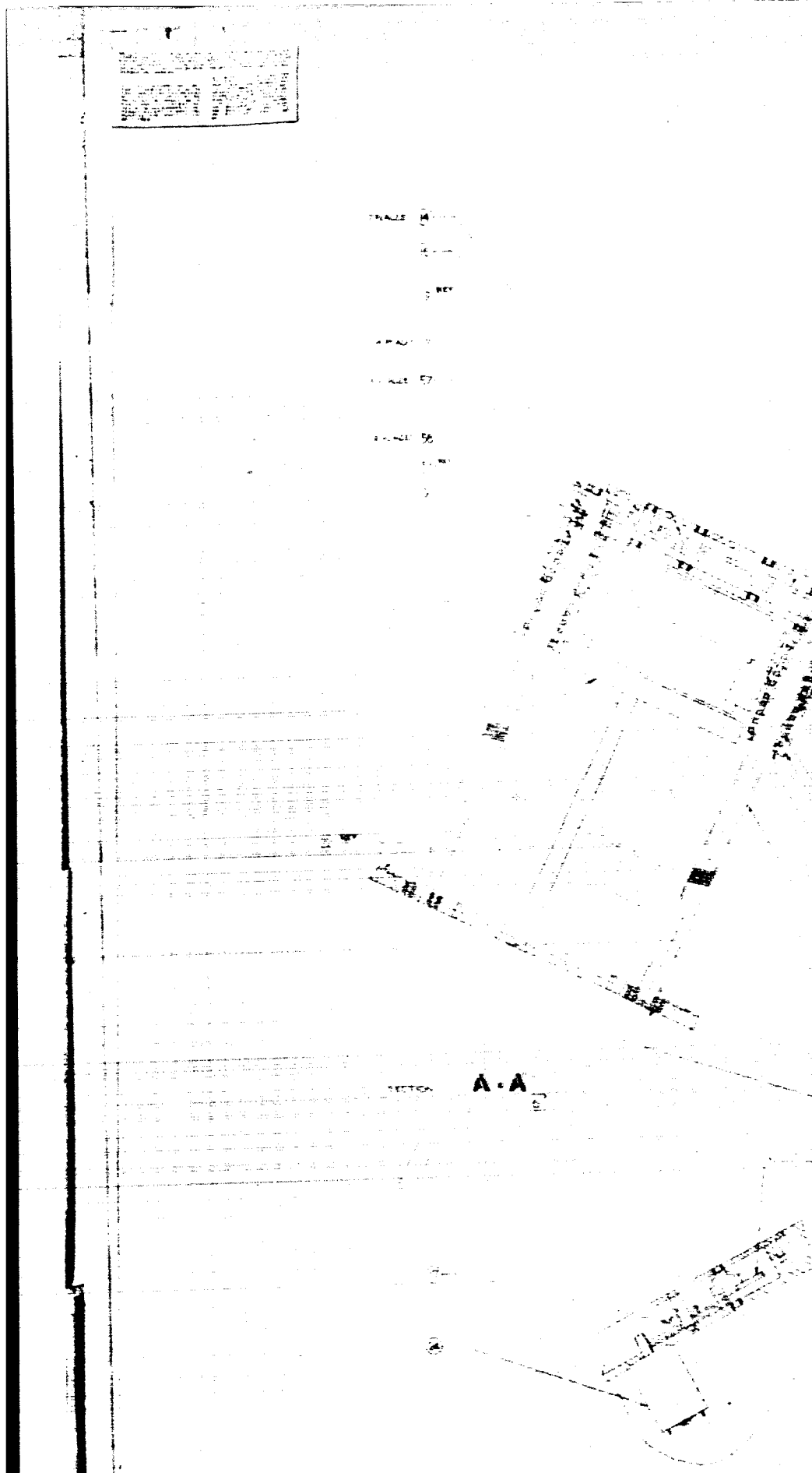

CHAMFER A (TYP)
SKIN LINE
CONNECTOR - (J1)
CONNECTOR - (J2)
SEE NOTE 15
(FEET SPEC)
HEATER
6.07
(PROBE IN FULL EXTENDED POSITION)



10000070

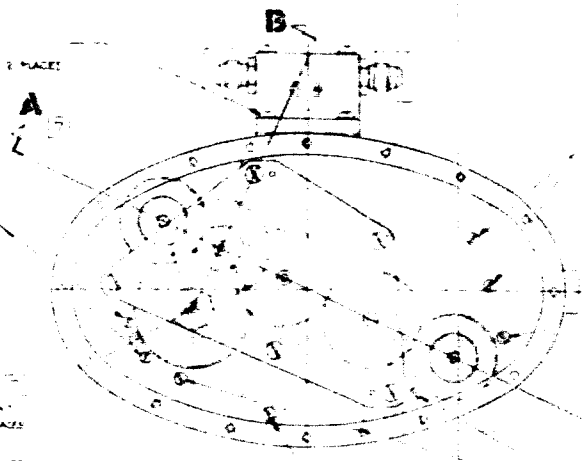
FIGURE B Page 36

10000070

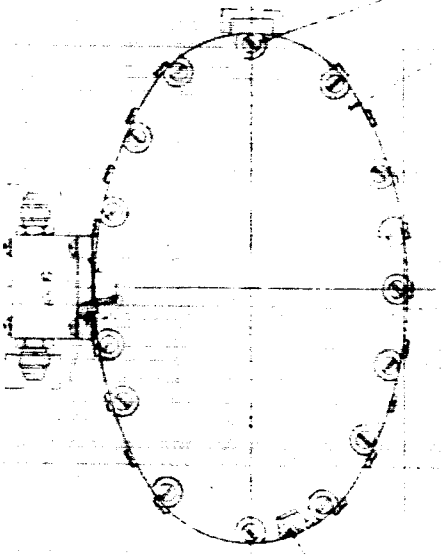


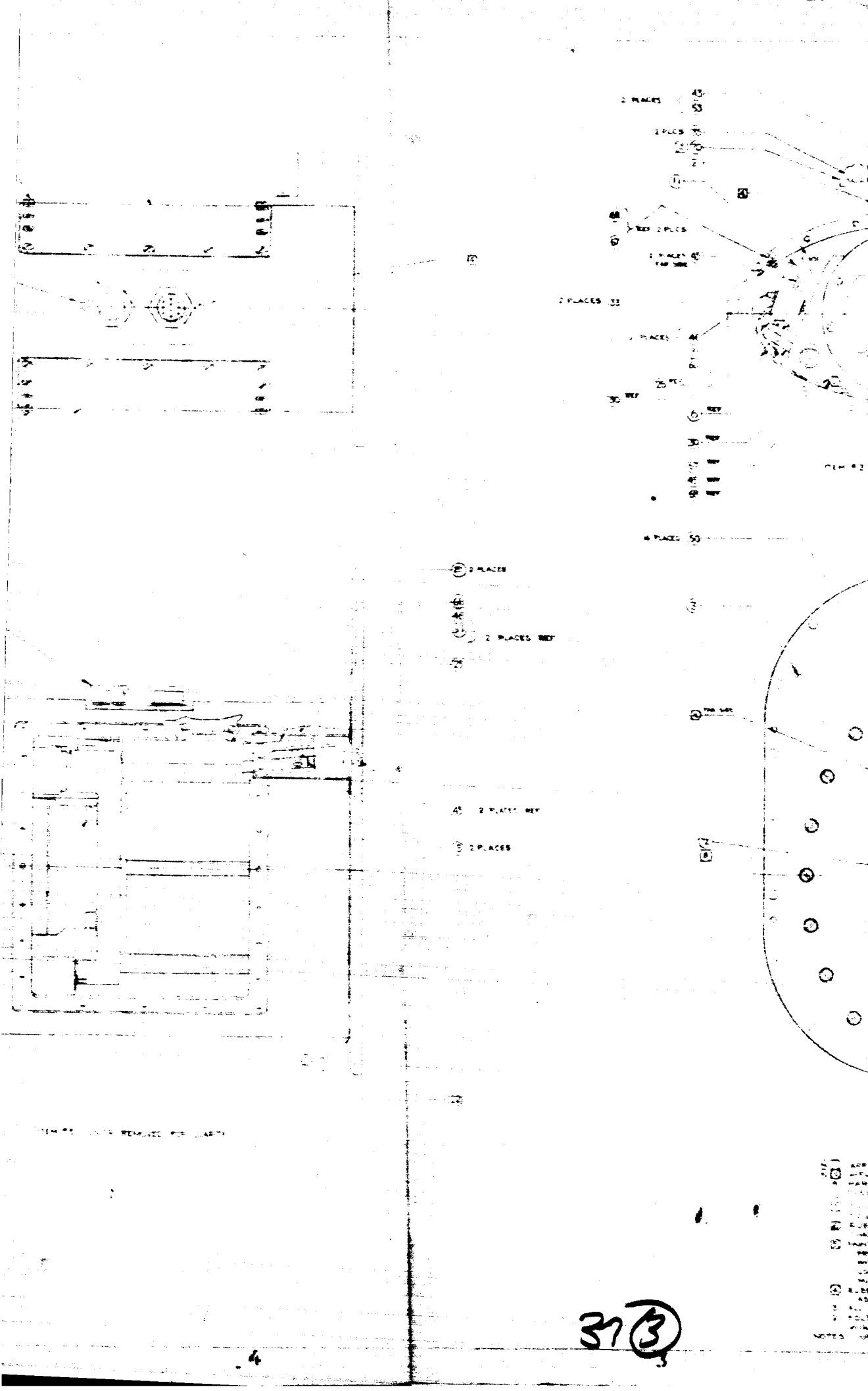
SECTION A • A

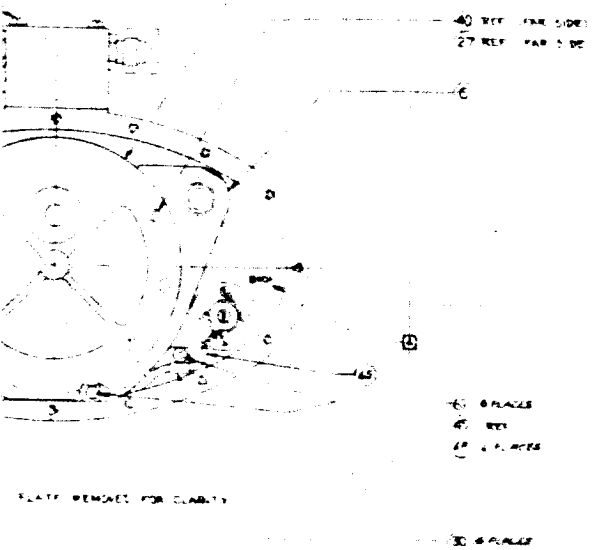
SECTION B • B



ITEM 9.4 COVER REMOVED FOR CLARITY




2 PLACES
2 PLCS
2 PLACES
2 PLACES
2 PLACES



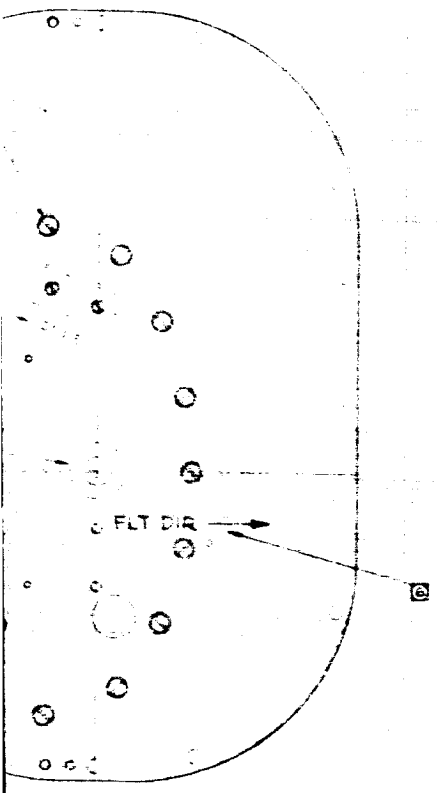
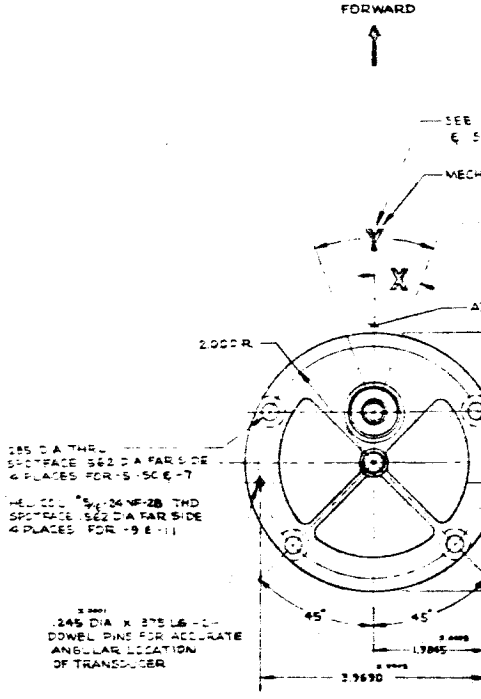
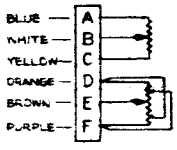
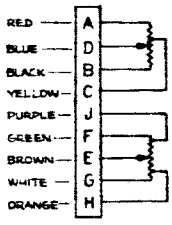


FIGURE C Page 37 (4)

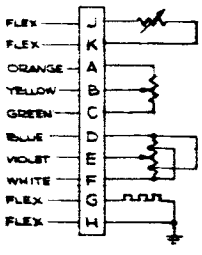




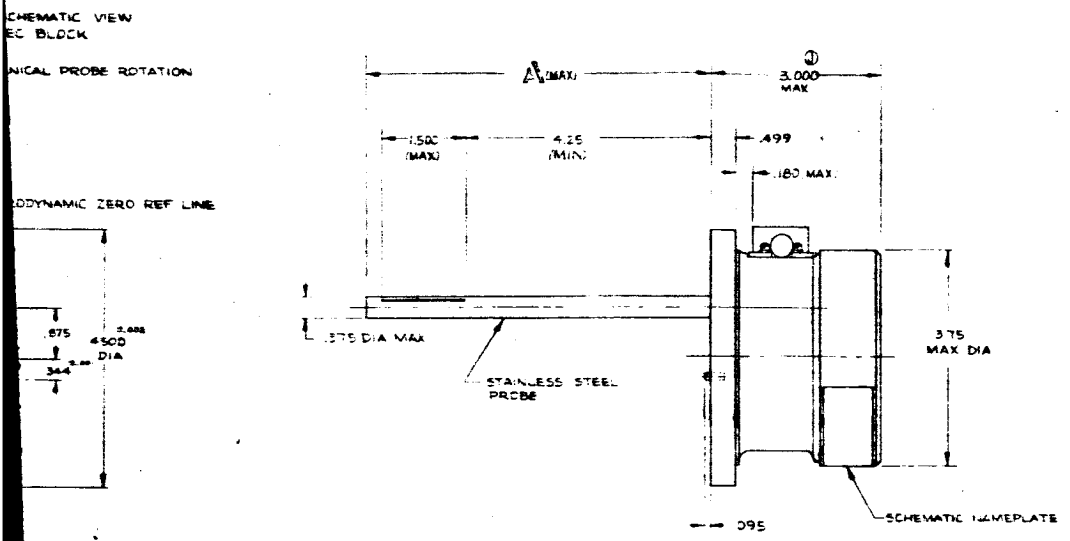
SCHEMATIC FOR -5-5C & -11



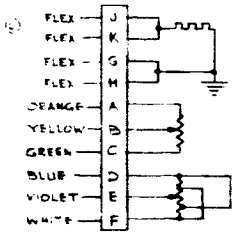
SCHEMATIC FOR -7



SCHEMATIC FOR -13



MODEL	TOTAL RES POT A	TOTAL RES POT B	TAPS POT A	TAPS POT B	TOTAL ELECT ANGLE POT A	TOTAL ELECT ANGLE POT B	TOTAL MECH ANGLE ANGLE	TOTAL MECH ANGLE ANGLE	PROBE LENGTH	LINEARITY BETWEEN TAPS POT A	LINEARITY BETWEEN TAPS POT B	MAX CURRENT THRU POTS POT A	MAX CURRENT THRU POTS POT B	CABLE LENGTH
-5	900Ω ±5%	9200Ω ±5%	NONE		60°	30°	20°	40°	6.25	.22%	.36%	3.0MA	3.5MA	30.00 +.50
-55	900Ω ±5%	9200Ω ±5%	NONE		60°	30°	20°	40°	6.25	.22%	.36%	3.0MA	3.5MA	30.00 +.50
-7	4700Ω ±5%	14.7KΩ ±5%	ABUZEYN ZERO		12°	30°	0°	20°	6.25	1%	5%	5.0MA	5.0MA	18.00 +1.00
-11	1500Ω ±5%	9200Ω ±5%	NONE		60°	30°	20°	40°	6.25	.22%	.36%	3.0MA	3.5MA	11.00 +1.00
-15	900Ω ±5%	9200Ω ±5%	NONE		60°	30°	20°	40°	6.25	.22%	.36%	3.0MA	3.5MA	11.00 ± 1.00
② -15	900Ω ±5%	9200Ω ±5%	NONE		60°	30°	20°	40°	6.25	.22%	.36%	3.0MA	3.5MA	11.00 ± 1.00



SCHEMATIC FOR -15
③

7 -15C IDENTICAL TO
THAT THE UNIT
MADE OF TEST

③ E LOOKING AT PROBE
CLOCKWISE ROTAT
E-15 MODELS E BE

⑤ PROBE SLOT PRO
DURING NORMAL

④ TAP FLAT ZONE

⑤ DASH NO. MUST
PROVIDED AFTER

② TOTAL MECHANIC
ELECTRICAL ANI

① ELECTRICAL ANG
E ELECTRICAL E AN

NOTES: UNLESS OT

3 5 (2)

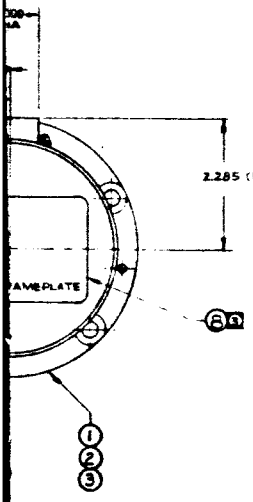


FIGURE D Page 38 (3)

12792 L

6036	PROTECTOR	
15968	NAMEPLATE	
14998-3	FINAL ASSY	
9978	FINAL ASSY	
15262-1	FINAL ASSY	
15262-3	FINAL ASSY	
15262	FINAL ASSY	

-15 -8 -11 -9 -7 -5C -5

ECHANICALLY & ELECTRICALLY THE C INDICATES
UNDERGO ADDITIONAL TESTS & GRAPHS
TS PER CUSTOMER REQUEST

OF POTENTIOMETERS, RESISTANCE SHALL INCREASE ON
TWEEN WIPERS B & E AND TERMINALS A & D FOR S-5C-11,-13,
WIPERS D & E & TERMINALS A & F FOR -7 MODEL

E WITH RED FLAG SHALL BE SLIPPED OVER PROBE
RIODS OF MISSILE OR AIRCRAFT ON -5 -5C & 7

NOT EXCEED 5 WIRE TURNS ON POTENTIOMETER

ED TO NAMEPLATE IN BLANK SPACE
INSPECTION.

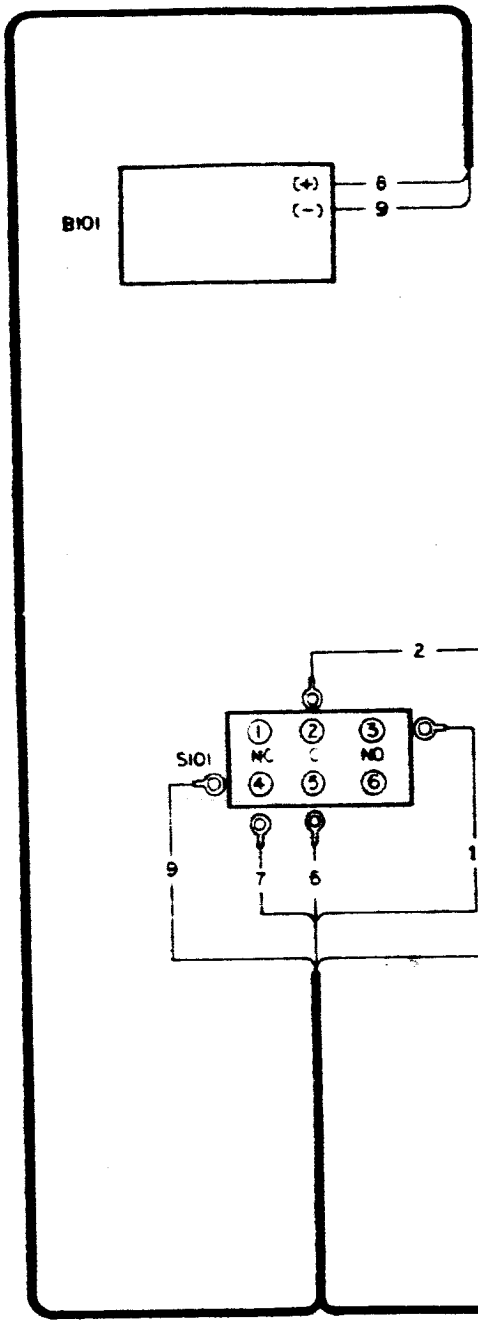
NGE SHALL NOT BE LESS THAN THE TOTAL
RANGE BY MORE THAN .2°

MIC ZERO ALIGNMENT SHALL BE FOR MECHANICAL
MIC CENTERED SHALL CONSIDER WITHIN 0.5°
E RECTIFIED

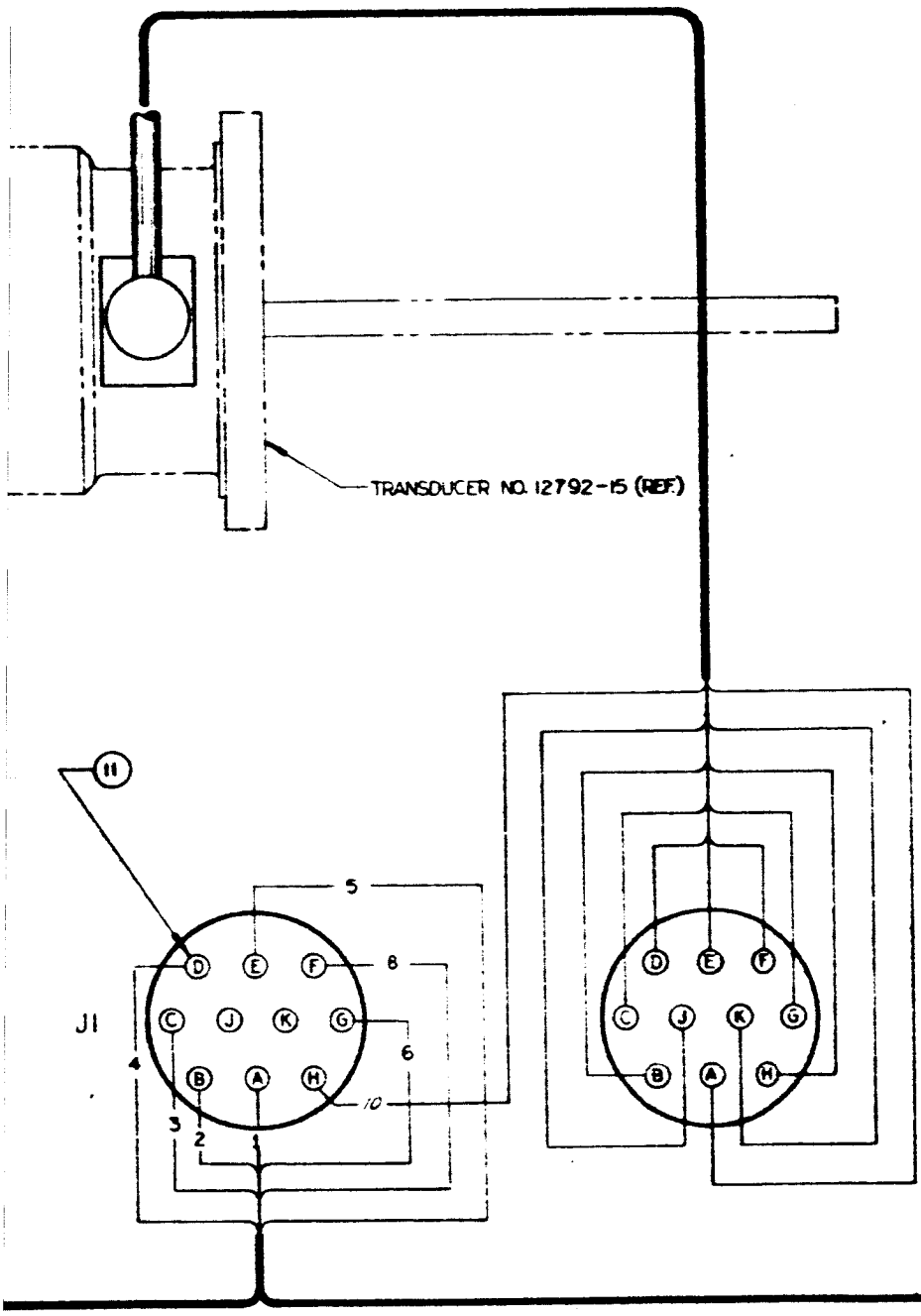
OUTLINE DRAWING-
ANGLE OF ATTACK
TRANSDUCER

FINAL

12792 L



	10	J101-4	J1-H	CABLE LEAD	GRAY	22
	1	J1-A	S101-3	19 STRAND MIL-W-16878 TYPE 'B'	ORANGE	22
	2	J1-B	S101-2		YELLOW	
	3	J1-C	S102-6		GREEN	
	4	J1-D	S102-5		BLUE	
	5	J1-E	S102-2		VIOLET	
	6	J1-C	S101-5		WHITE	
	7	S101-4	S102-1	19 STRAND MIL-W-16878 TYPE 'B'	BROWN	22
	8	B101-+	J1-F	MOTOR LEAD	RED	20
	9	B101--	S101-4	MOTOR LEAD	BLACK	20
	WIRE NO	FROM / POINT TO POINT	TO	WIRE TYPE	COLOR	SIZE AWG



2. FOR SCHEMATIC DIAGRAM SEE DRC# 110004
1. SOLDER WIRES PER MIL-S-6872

		REL FOR PROD	PA	3/13	

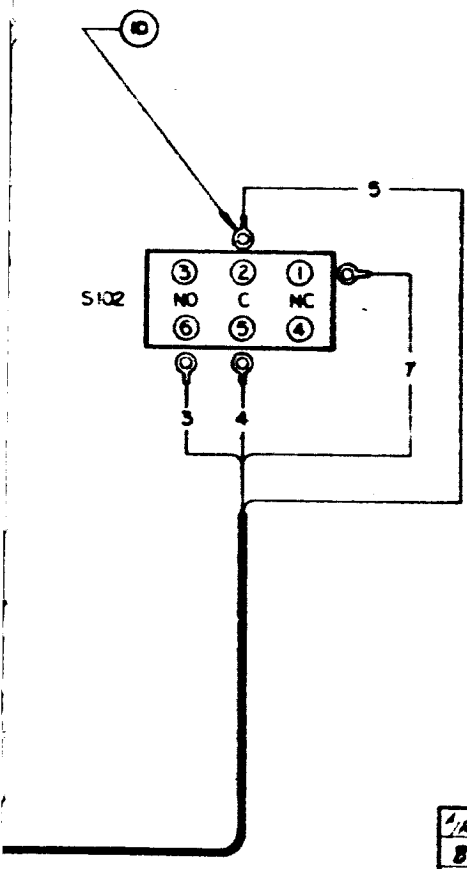
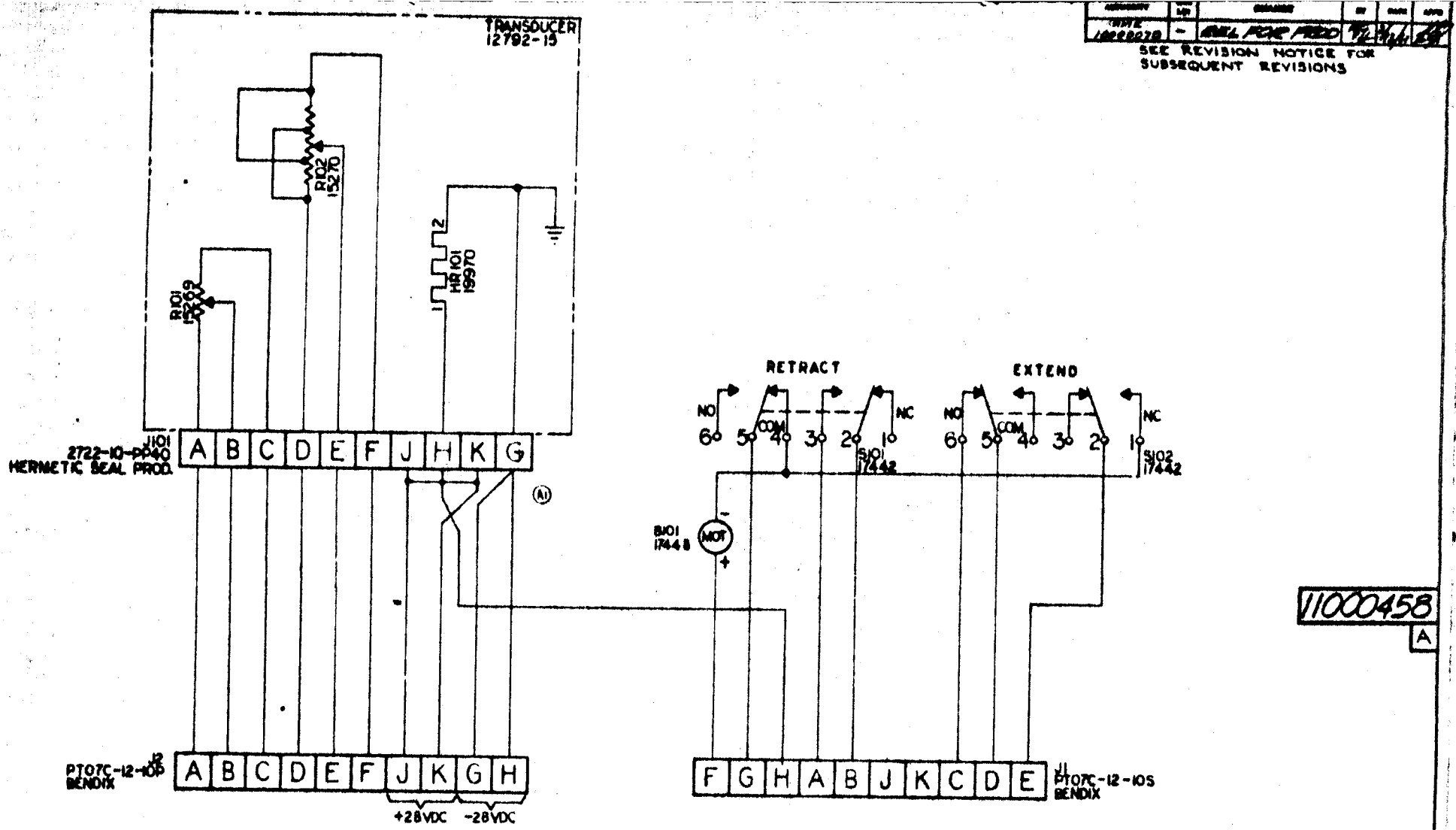


FIGURE E Page 39 (3)

11000459

A/R	SN60	SOLDER		QQ-S-571	10
8	14 AWG	VINYL SLEEVING	VINYL TUBING .25 LG	MIL-I-631 TYPE II GRADE C FORM U	11
9	321017	TERMINAL LUG		AMERICAN PANCOR INC MATERIAL FEB	12
					9
					8
A/R	22 AWG	WIRE 19 STRAND	BROWN	MIL-W-16878 TYPE B	7
			WHITE		6
			VIOLET		5
			BLUE		4
			GREEN		3
			YELLOW		2
A/R	22 AWG	WIRE-19 STRAND	ORANGE	MIL-W-16878 TYPE B	1

19982-3	WIRING DIAGRAM - RETRACTABLE TRANSDUCER ANGLE OF ATTACK	U.S. SCIENCE CORPORATION	11000459



SEE REVISION NOTICE FOR SUBSEQUENT REVISIONS

11000458 A

2. WHEN TRANSDUCER IS FULLY EXTENDED S101 & S102 ARE AS SHOWN
1. FOR WIRING DIAGRAM SEE DEC #11000459

UNLESS OTHERWISE SPECIFIED

SCHEMATIC DIAGRAM
RETRACTABLE PROBE

U.S. SCIENCE CORPORATION

11000458 A

SHEET 1 OF 1

19982-3

40

FIGURE F

U S SCIENCE CORP 10-27-61 405 PMPST

MSC 4706
CONTRACTING OFFICER
NASA, GFC C MARSHALL SPACE FLT CTR
HUNTSVILLE ALA

REF CONTRACT NAS 8-2456 - ENVIRONMENTAL TESTING OF RETRACTABLE PROBE

CONFIRMATION REQUESTED OF DECISIONS MADE DURING RESIDENCE OF MR RICHARD TUTT OF NASA AT USSC DURING WEEKS OF 18 SEPTEMBER AND 25 SEPTEMBER 1961. USSC ENGINEERING AND MR TUTT CONCURRED IN THE FOLLOWING.

ITEM 1. PARAGRAPH 2, APPLICABLE SPECIFICATION
DELETE PARA. 2C.. USSC TEST PROCEDURE PTP 12792-15. REASON..
THIS REQUIRES DISASSEMBLY AFTER EACH EXPOSURE. USE OF ONLY ITP 19000 WAS AGREED UPON.

ITEM 2. PARAGRAPH 3, TEST SCHEDULE.
TEST SEQUENCE REARRANGED TO ACCOMMODATE MR TUTTS RESIDENCE AT USSC, CHANGED AS FOLLOWS..
1. ACCEPTANCE TEST PER ITP 19000,
2. DYNAMIC SHOCK
3. ALT SHOCK
4. VIBRATION
5. RAIN
6. LOW TEMP EXPOSURE
7. LOW TEMP OPERATION
8. ACCELERATION
9. HUMIDITY
10. HIGH TEMPERATURE EXPOSURE
11. HIGH TEMP OPERATION
12. HEATER ENDURANCE
13. SALT SPRAY
14. SAND AND DUST
15 FUNGUS
16. ENDURANCE

ITEM 3. DURING PERFORMANCE OF VIBRATION TEST /PARA. 10/, SPRING RETTAINERS LOOSENED AND SUBJECT TRANSDUCER CAME LOOSE IN THE HOUSING. ENGINEERING AND MR TUTT CONCURRED IN REPAIRING UNIT, REPLACEMENT OF END PLATE AND STAKING SPRING RETAINER WITH EPOXY CEMENT. TEST WAS REPEATED AND TESTING PROCEEDED.

ITEM 4. PARAGRAPH 13. ALTITUDE SHOCK. CHAMBER OF VOLUME 15X NOT AVAILABLE. USSC ENGRG AND MR TUTT CONCURRED IN SUBSTITUTION OF VOLUME APPROXIMATELY 5X VOLUME OF HOUSING.

ITEM 5.
AFTER PERFORMANCE OF SALT SPRAY TESTS, THE SUBJECT HOUSING SHOWS SOME EVIDENCE OF CORROSION. SINCE OPERATION OF UNIT IS STILL SATISFACTORY AND PERFORMANCE IS PER SPECIFICATION, PERMISSION TO PROCEED TO SAND AND DUST WITHOUT REPAIR OF SURFACE FINISH IS REQUESTED. OBJECT OF TEST IS TO EXAMINE FUNCTIONAL PARAMETERS, HENCE USSC ENGINEERING REQUESTS CONCURRENCE.

G W LEWIS, CONTRACTS COORDINATOR
END PLS ACK

Reply to foregoing TWX:

Formal approval to the foregoing TWX had not been received at the time this report was printed.

Inasmuch as the cognizant resident NASA representative concurred in the variations as described, approval hereinafter is assumed and reference to this page is made later in this report in the individual test report sections.

III

TEST REPORTS

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF

TEST REPORT NO. 1

OF

Qualification Test Report, QTR 10000070

Customer: NASA	USSC Job No.: 124-004
Customer P.O.:	Contract No.: NAS8-2456
Customer Specs: NAS8-2456	USSC Specs: ITP 19600

Unit: Probe, Retractable, Transmitter, Angle of Attack

Type No.: Part No.: 10000070 S/N: 107 113

Test	Specification
Acceptance Tests	NAS8-2456 ITP 19600

Test Conducted By: U. S. Science Corp. Date: 9/15/61 9/18/61

C. Arbeau

Test Technician

Test Certified By: Michael A. LaVere Date: 9/18/61

Test Engineer

USSC FORM 15

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date _____

Serial No. 107, 113 Test No. 1 Run No. _____ Proj. Engineer _____

1.0 Requirement: NAS8-2456, Paragraph 4

1.1 Subject Units 1 and 2 to all of the tests defined in U. S. Science Corp. Inspection Test Procedure 19600 referenced herein. The results shall be approved by the appointed authority before commencing any further with the test program, and the results shall form the basis of comparison during the remaining tests.

2.0 Procedure:

2.1 Units, serial numbers 107, and 113, were received at U. S. Science Corp. as "Government Furnished Equipment". A careful visual examination was performed to ascertain that no obvious physical damage was sustained as a result of shipment. The units were thereupon subjected to the provisions of ITP 19600. A copy of this specification is included within the body of this report. A test data sheet follows, which indicates the results of these tests.

3.0 Conclusions:

3.1 The subject units met all of the provisions of the test requirements with the exception of Air Jet Calibration. Air Jet Calibration consists of applying controlled amounts of air pressure, through two jets, which are permanently affixed to the retraction housing. It is the purpose of this test to determine that:

a. The probe is capable of unrestricted movement while in the retracted position.
b. The potentiometers contained within the transducer are operating properly and will accurately indicate the angular position of the probe.

3.2 The Air Jet Calibration is a static test in that it is performed while retracted and has no purpose during flight or dynamic performance. These results were presented to the resident NASA representative whereupon it was agreed that no corrective action would be taken at this time and the remainder of the test program should be performed per schedule.

Test Engineer _____ Test Engineer _____

USSC FF M 20

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107, 113 Test No. 1 Run No. Proj. Engineer

Equipment

Static:

Power Supply, 60 Volt DC, 0-5 Amps
Adjustable Air Supply, 90 to 110 lbs.

Dynamic:

Wind Tunnel Console, Chrysler Corp., Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp., Part No. 10313089A
Stop watch, Jaquet (No part number shown)

Test Engineer Test Engineer

USSC FT M 20

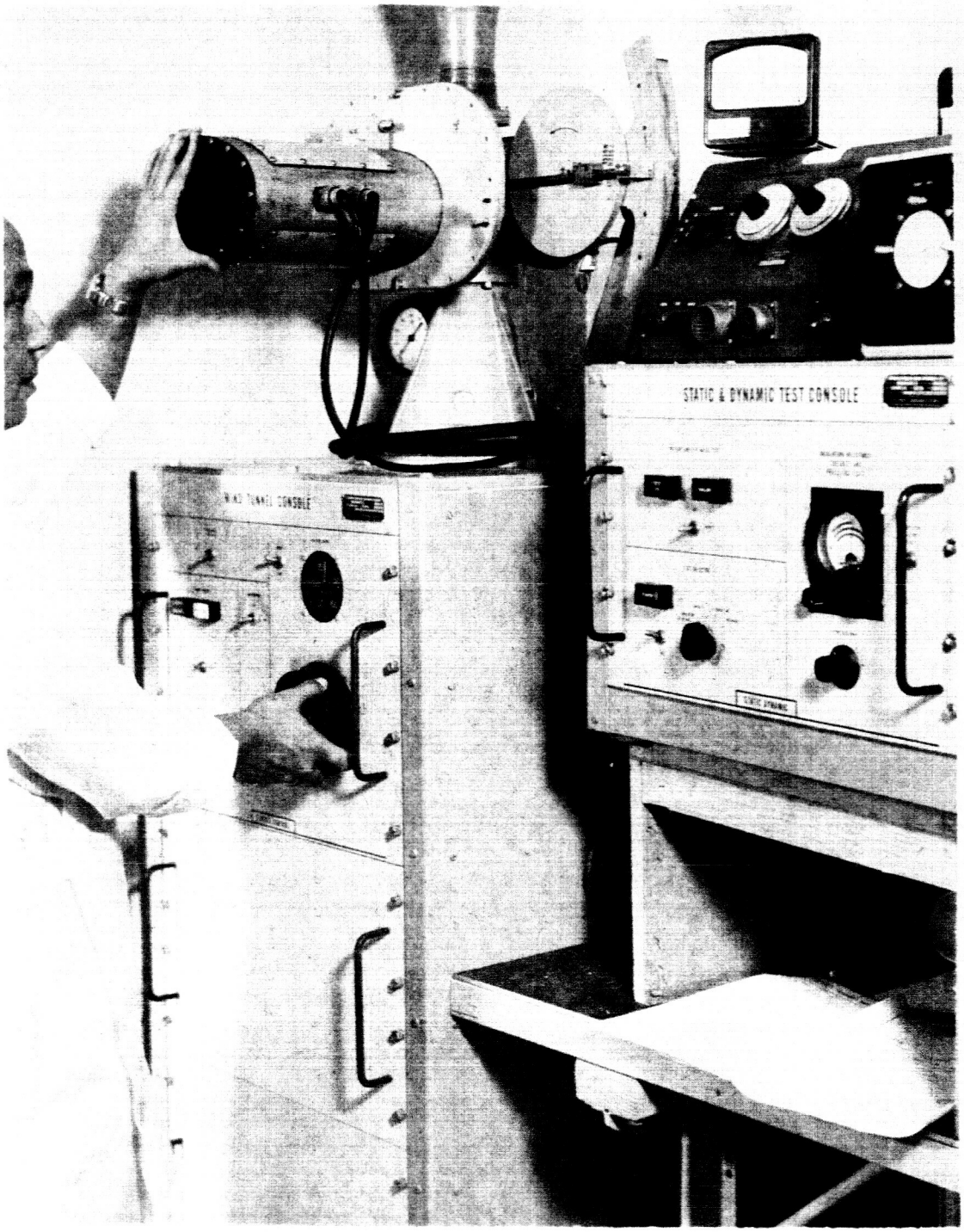


FIG. 1 [illegible]

PRE-QUALIFICATION TEST DATA

DATA SHEET
17409

DATE 18 SEPT. 61

S/N 107

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass

NOTES:

Tester C W Osborne

PRE-QUALIFICATION TEST DATA DATA SHEET
17409

DATE 15 SEPT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass

NOTES:

Tester C W Arbeau

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF.

TEST REPORT NO. 2

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transmitter, Angle of Attack

Type No. _____ Part No. 10000070 S/N 113

Test	Specification
Dynamic Shock	NAS8-2456 ITP 19600

Test Conducted By: Rototest Labs — Date 9/20/61
Subcontract Test Facility
C. Arbeau — Date 9/21/61
Test Technician

Test Certified By: M. A. LaVere — Date 9/21/61
Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 2 Run No. Proj. Engineer

1.0 Introduction:

1.1 Test equipment for conducting Dynamic Shock in accordance with the test requirements was not available at U. S. Science Corp., the test was performed at:

Rototest Laboratories
2803 Los Flores Boulevard
Lynwood, California

1.2 The test was performed under the direction of a U. S. Science Corp. test engineer and was witnessed by the resident NASA representative, Mr. Richard Tutt. A copy of the certified test report, Rototest Report No. 3276 (2) follows.

1.3 Required tests per ITP 19600 were conducted at U. S. Science Corp. facilities at the conclusion of each phase of Dynamic Shock. A test data sheet indicating the results of these tests follows the text of this report.

1.4 Testing to PTP 12792-15 was not accomplished. Elimination of this requirement was agreed upon since disassembly is necessary to perform per this specification and reference to page 42 of this report is made.

Note: The test requirement of paragraph 12, NAS8-2456, part A, should read 50 g not 20 g. The test was performed in accordance with the revised requirement.

1.5 Change order revising paragraph 12 follows.

Test Engineer Test Engineer

USSC FF 4 20

CHANGE ORDER
(OR ADMINISTRATIVE CHANGE)

PAGE NO.	NO. OF PAGES
1	1

REQUISITION NO./PURCHASE AUTHORITY	CONTRACT (Order) NO.	MODIFICATION NO.
TP 83-127	NAS8-2456	1

TO: *(Contractor's name and address)*

U. S. Science Corporation
5221 West 102nd Street
Los Angeles 45, California

ISSUED BY

George C. Marshall Space Flight Center
National Aeronautics & Space Administration
Huntsville, Alabama

Alexander/ws

☒ PURSUANT TO THE "CHANGES" CLAUSE OF THE ABOVE-NUMBERED CONTRACT, THE FOLLOWING CHANGES ARE MADE THEREIN.

☐ THE ABOVE-NUMBERED CONTRACT IS MODIFIED TO REFLECT THE FOLLOWING ADMINISTRATIVE CHANGES.

The symbols "20 g" appearing in sub-paragraphs (1), (2), and (3) at the top of Page 6 of the Contract Schedule are deleted and the symbols "50 g" are substituted therefor.

Except as hereby modified, all terms and conditions of said contract as heretofore modified remain unchanged and in full force and effect.

DATE September 22, 1961

UNITED STATES OF AMERICA

BY Marion S. Hardee
SIGNATURE OF CONTRACTING OFFICER

Marion S. Hardee
TYPED NAME OF CONTRACTING OFFICER

MSFC - FORM 64-1 (JUNE 60)

Service To:	Report No. 3276
U. S. SCIENCE CORPORATION 5221 WEST 102ND STREET LOS ANGELES 45, CALIF.	Purchase Order No. 1-108978 Contract No. -- Date NOVEMBER 1, 1961

CERTIFIED TEST REPORT

ENVIRONMENTAL TESTING

OF

TRANSDUCER,

ANGLE OF ATTACK WITH RETRACTABLE PROBE

rototest laboratories
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

COUNTY OF LOS ANGELES) SS
STATE OF CALIFORNIA)

VERN L. SANDBERG, LABORATORY SUPERVISOR,
being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Vern L. Sandberg

SUBSCRIBED and sworn to before me this 1ST day of NOVEMBER, 1961

Ruby T Archambault

Notary Public in and for the County of Los Angeles, State of California.
My commission expires OCTOBER 2, 1962

Tests Conducted By:

HENRY BURMANN Henry Burmann
EARL CHAPMAN Earl Chapman
ALBERT G. KLEINKNECHT Albert G. Kleinknecht
JAMES B. ROSE James B Rose by Le
WILLIAM J. KOLBERG William J. Kolberg by Le

Certified By: Andrew McKendry
Quality Control Engineer

Form QC-11
1/1/59

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

ADMINISTRATIVE DATA

DATE: NOVEMBER 1, 1961

NAME OF PART: TRANSDUCER, ANGLE OF ATTACK WITH RETRACTABLE PROBE

PURPOSE OF TEST: ENVIRONMENTAL TESTING

MANUFACTURER: U. S. SCIENCE CORPORATION

MANUFACTURER'S TYPE OR PART NO.: 10000070

DRAWING, SPECIFICATION OR EXHIBIT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456 SCHEDULE

QUANTITY OF ITEMS TESTED: ONE (1) SAMPLE

SECURITY CLASSIFICATION OF ITEMS: UNCLASSIFIED

DATE TEST COMPLETED: NOVEMBER 1, 1961.

TEST CONDUCTED BY: ROTOTEST LABORATORIES, INC.

DISPOSITION OF SPECIMENS: THE SAMPLE WAS RETURNED TO U. S. SCIENCE CORPORATION.

SIGNATURES:

Vern L. Sandberg
VERN L. SANDBERG
LABORATORY SUPERVISOR

ABSTRACT:

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

TABLE OF CONTENTS

Test Number	Title of Test	Page
	Introduction	0.2
1.	Acceleration	1.0
2.	Dynamic Shock	2.0
3.	Rain	3.0
4.	Humidity	4.0
5.	Salt Spray	5.0
6.	Sand and Dust	6.0

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION

REFERENCE: U. S. SCIENCE CORPORATION PURCHASE ORDER NO. 1-108978; U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-246; ROTOTEST LETTER DATED SEPTEMBER 8, 1961

REQUIREMENT: TO PERFORM ENVIRONMENTAL TESTING IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AS FOLLOWS:

TEST NUMBER	TITLE OF TEST	SAMPLE	U. S. SCIENCE CONTRACT NO. NAS8-2456 PARAGRAPH
1.	ACCELERATION	1	10
2.	DYNAMIC SHOCK	1	12
3.	RAIN	1	18
4.	HUMIDITY	1	14
5.	SALT SPRAY	1	15
6.	SAND AND DUST	1	16

GENERAL TEST INFORMATION.

SAMPLE MOUNTING

THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS.

SAMPLE IDENTIFICATION

MFG PART NO.	SERIAL NO.	ROTOTEST SAMPLE NO.
1000070	113	1

ELECTRICAL MEASUREMENTS

ALL INSTRUMENTS AND AUXILIARY APPARATUS USED, WITH MANUFACTURER'S NAME, MODEL OR TYPE NUMBER AND SERIAL NUMBER ARE DESCRIBED IN THE INDIVIDUAL EQUIPMENT LISTS. ALL ELECTRICAL METERS HAVE BEEN CALIBRATED BY THE QUALITY ELECTRIC COMPANY OF LOS ANGELES AT APPROXIMATELY SIX MONTH INTERVALS. TEST INSTRUMENTS HAVE BEEN CALIBRATED BY QUALIFIED INDEPENDENT FACILITIES AT APPROXIMATELY 12 MONTH INTERVALS.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION - CONTINUED

GENERAL TEST INFORMATION: - CONTINUED

ADDITIONAL INFORMATION

ROTOTEST LETTER DATED SEPT. 8, 1961

"1. U. S. SCIENCE WILL SUPPLY A SUITABLE FIXTURE FOR THE ACCELERATION AND SHOCK TESTS.

2. THE UNIT WILL BE RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING."

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

2. DYNAMIC SHOCK

SAMPLE 1

REFERENCE: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, PARAGRAPH 12; ROTOTEST LETTER DATED SEPTEMBER 8, 1961, NOTE 3

REQUIREMENT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456

"12. SHOCK: THE SHOCK TEST SHALL BE CONDUCTED AS SPECIFIED IN MIL-E-5272C PROCEDURE 3 PARAGRAPH 4.15.3 AS HEREIN MODIFIED.

A. PERFORM 6 TESTS ON EACH OF THE 3 MAJOR AXES OF THE UNIT USING ONE OF THE FOLLOWING CONDITIONS.

(1) 20 G FOR TEN MILLISECONDS AT CHASSIS (TRIANGLED SAWTOOTH WAVEFORM).

(2) 20 G FOR EIGHT MILLISECONDS AT CHASSIS (SINEWAVE).

(3) 20 G FOR SIX MILLISECONDS AT CHASSIS (SQUARE WAVE).

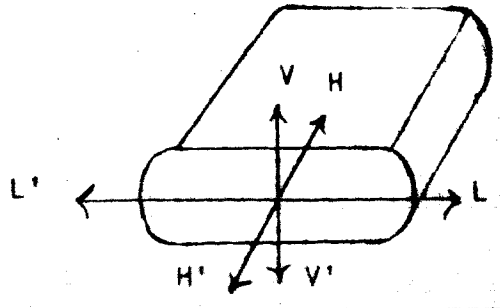
B. AFTER EACH PLANE OF SHOCK TESTING PERFORM THE TEST OF ITP 19600 AND PTP 12792-15."

ROTOTEST LETTER DATED SEPTEMBER 8, 1961

"3. IN THE SHOCK TEST, THE UNIT WILL BE SUBJECTED TO SIX SHOCKS IN EACH OF THREE MUTUALLY PERPENDICULAR AXES, EACH SHOCK TO BE OF 20 G INTENSITY AND 8 MILLISECONDS IN DURATION (SINE WAVE)."

PROCEDURE: THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS ON AN ALUMINUM PLATE. THE SAMPLE AND PLATE ASSEMBLY WERE SUCCESSIVELY POSITIONED AND SECURED TO THE SHOCK TOWER CARRIAGE SO THAT THE FORCE WAS APPLIED IN EACH DIRECTION ALONG EACH OF THE THREE MUTUALLY PERPENDICULAR AXES. DURING AND AFTER THE SHOCK TEST, THE SAMPLE WAS EXAMINED FOR PHYSICAL DAMAGE.

DEFINITION OF AXIS



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NEvada 6-9238

2. DYNAMIC SHOCK - CONTINUED

EQUIPMENT:

TO MEASURE	SYMBOL	UNIT	APPARATUS
AMBIENT TEMPERATURE	TA	°C	MERCURY THERMOMETER, -10/110 x 1°C
MAGNITUDE OF SHOCK	G	GRAVITY	BARRY VARIPULSE SHOCK TOWER, MODEL 15575, S.N. 064; BRUEL AND KJAER ACCELEROMETER, MODEL 4329, S.N. 61565 AND AMPLIFIER, TYPE 4309; TEKTRONIX OSCILLOSCOPE, MODEL 515, S.N. 2122
DURATION OF SHOCK	MS	MILLI-SECOND	SAME

RESULTS:

DATE 1961	TIME	TA °C	MS MILLI-SECOND	G GRAVITY	NUMBER OF SHOCKS	SAMPLE	COMMENT
			8-11	50	18	1	SPECIFIED
HORIZONTAL AXIS							
9/21	10:00	25	10	50	3	1	NO VISIBLE DAMAGE.
HORIZONTAL AXIS - REVERSE DIRECTION							
9/21	10:15	25	10	50	3	1	NO VISIBLE DAMAGE.
VERTICAL AXIS							
9/30	3:00	27	10	50	3	1	NO VISIBLE DAMAGE.
VERTICAL AXIS - REVERSE DIRECTION							
9/20	3:30	27	10	50	3	1	NO VISIBLE DAMAGE.
LATERAL AXIS							
9/21	2:00	25	10	50	3	1	NO VISIBLE DAMAGE.
LATERAL AXIS - REVERSE DIRECTION							
9/21	2:15	25	10	50	3	1	NO VISIBLE DAMAGE.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

2. DYNAMIC SHOCK - CONTINUED

RESULTS: - CONTINUED

VISUAL OBSERVATION

THE SAMPLE SHOWED NO EVIDENCE OF PHYSICAL DAMAGE FOLLOWING DYNAMIC SHOCK.

NOTE. THE SAMPLE WAS RETURNED TO U. S. SCIENCE FOLLOWING EACH PLANE FOR PERFORMANCE TESTS.

CONCLUSIONS: SAMPLE 1 WAS NOT VISIBLY DAMAGED BY THE DYNAMIC SHOCK TEST. NO OTHER CONCLUSIONS WERE DRAWN BY THIS FACILITY.

JAMES B. ROSE

9/25/61
MM

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 2 Run No. Proj. Engineer

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1.

3.2 It can be concluded that the unit is capable of satisfactory performance after exposure to Dynamic Shock.

Test Engineer Test Engineer

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 2 Run No. Proj. Engineer

Additional Test Equipment

Wind Tunnel, Chrysler Corp., Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp., Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

USSC FT M 20

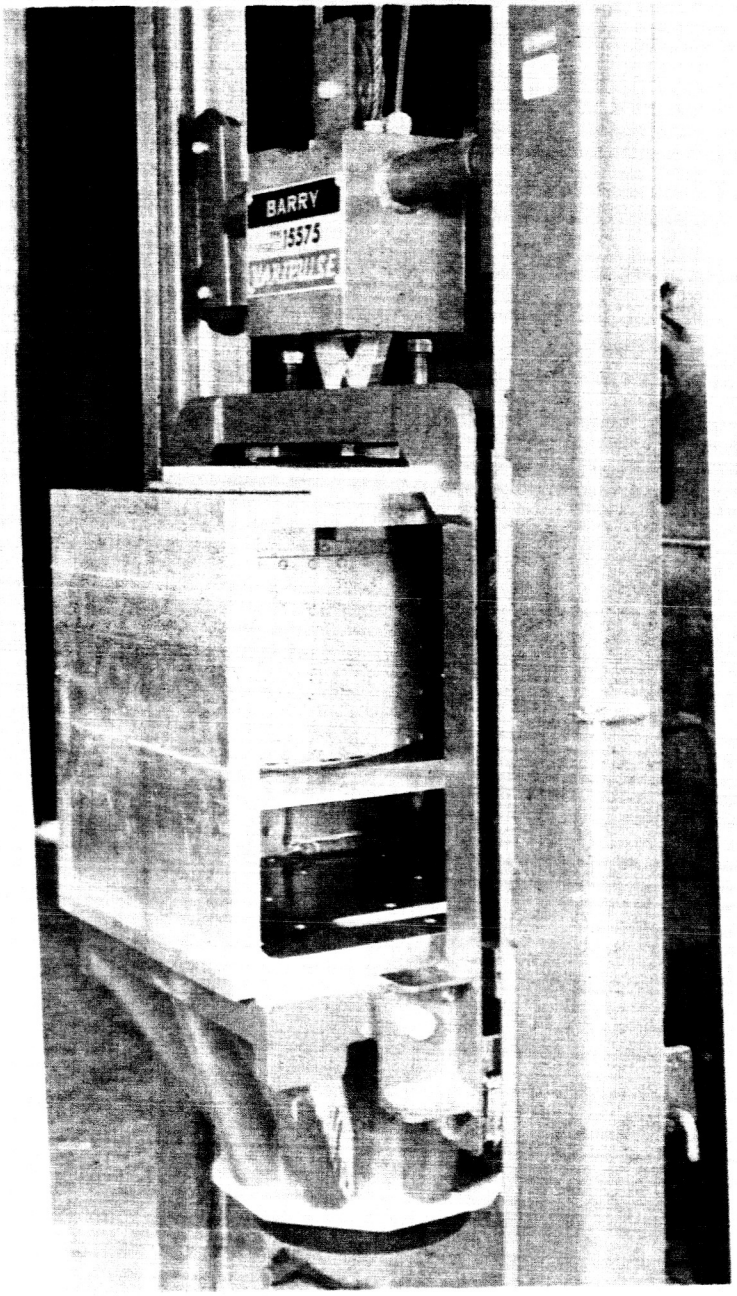


FIG. 1

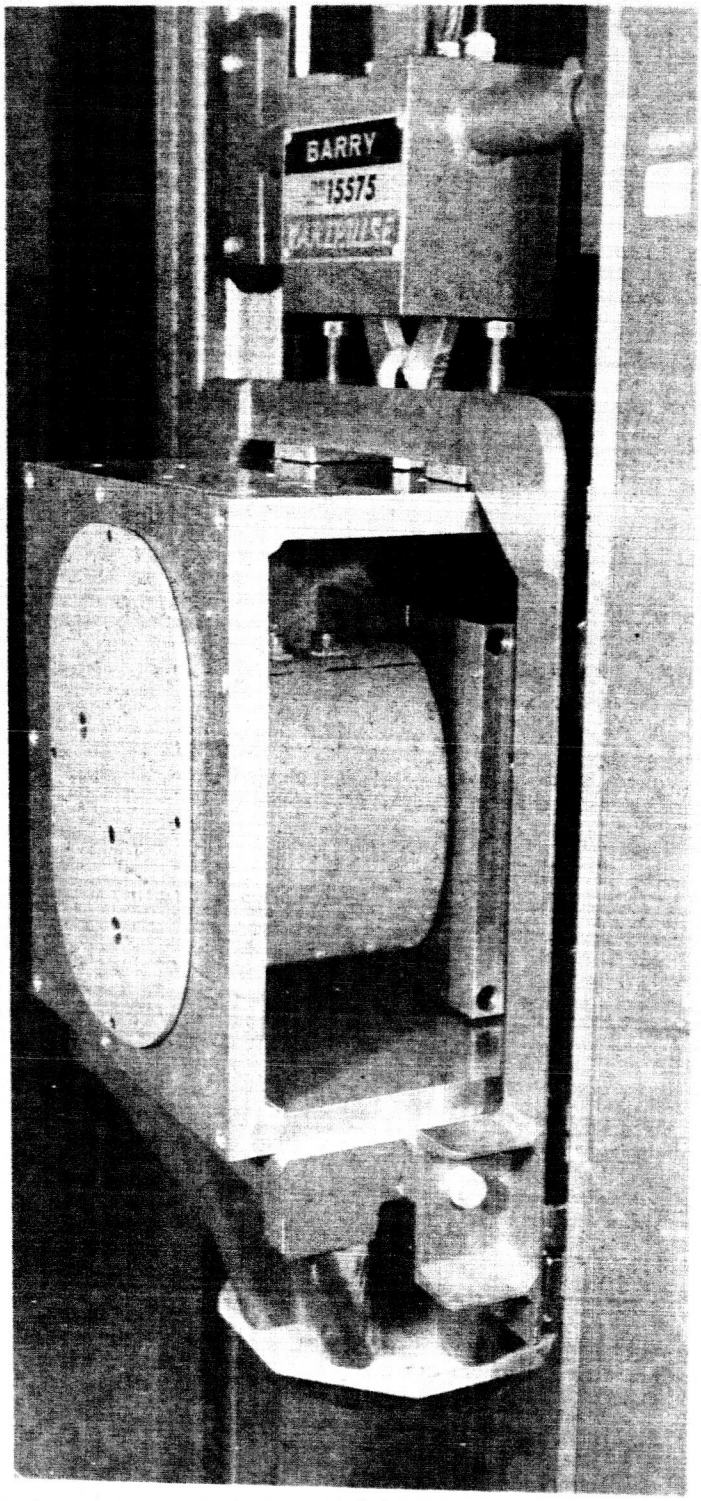


FIG. [illegible] DYNAMIC [illegible]
LATERAL PLANE

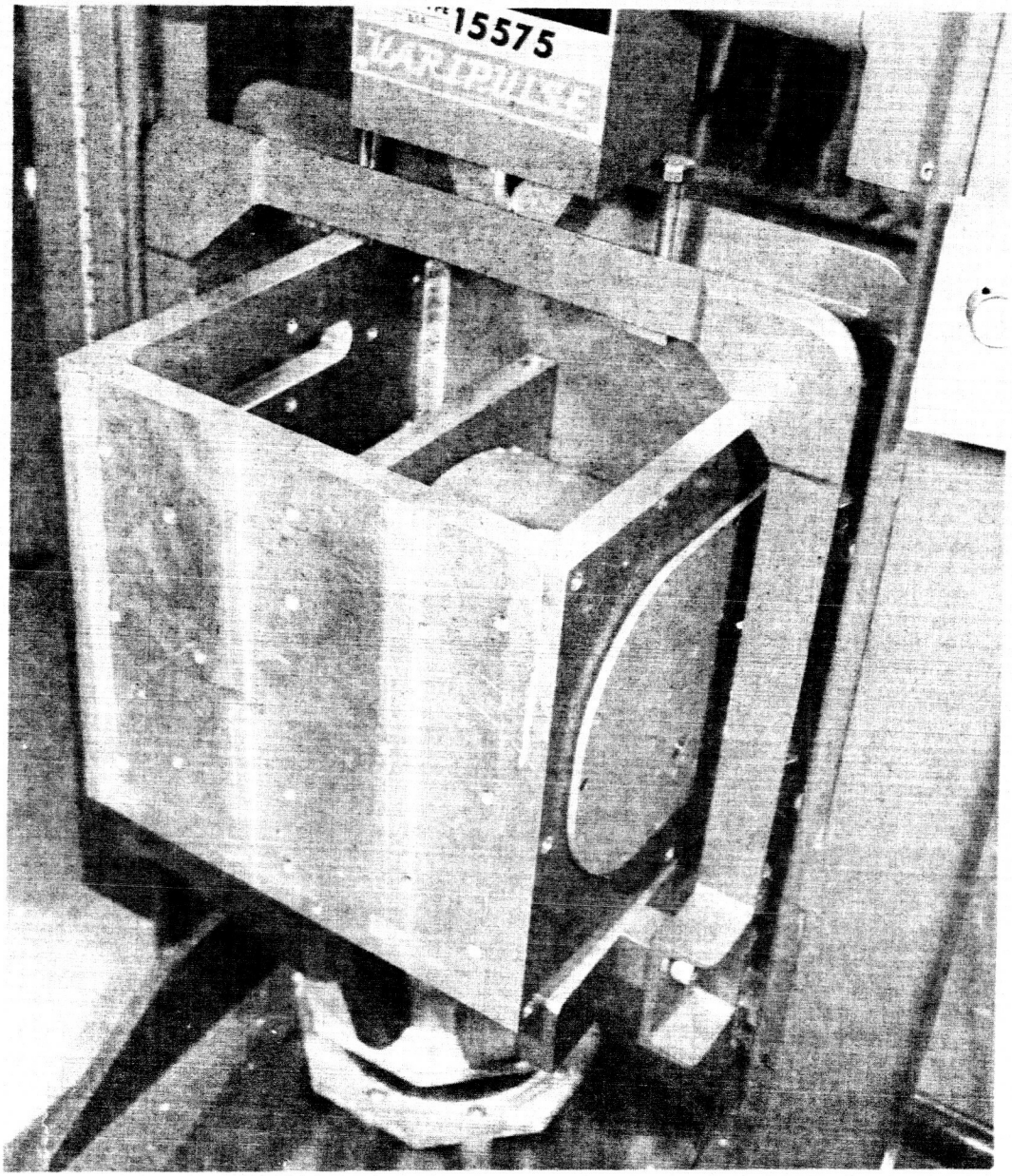


FIG. 5 [illegible]
VERTICAL PLANE

HORIZONTAL SHOCK TEST

DATA SHEET
17409

DATE 21 SEPT. 61

S/N 113

TEST	INSTRUCTIONS	STAMP
1. Megger	(Green portion of insulation resistance scale)	acc Pass
2. Zero	(Meter can be zeroed)	acc Pass
3. Linearity	(Green portion of linearity scale)	+14° acc Pass + 7° acc Pass - 7° acc Pass -14° acc Pass
4. Extend	(Maximum 15 seconds)	acc Pass
Retract	(Maximum 15 seconds)	acc Pass
5. Phase Lag	(15° maximum)	acc Pass
6. Noise	(Test ok lamp remains on)	acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs. acc Failed 100 lbs. acc Failed 110 lbs. acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Pass 110 lbs. acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)	acc Pass
	("on" when extended-"off" when retracted)	acc Pass
		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)	acc Pass

NOTES:

Tester C W Arbeau

LATERAL SHOCK TEST

DATA SHEET
17409

DATE 21 SEPT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration +	(Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
-	(Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass

NOTES:

Tester C W Arbeau

VERTICAL SHOCK TEST

DATA SHEET
17409

DATE 21 SEPT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass

NOTES:

Tester [signature]

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF.

TEST REPORT NO. 3

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600
			PTP 12792-15

Unit: Probe, Retractable, Transmitter, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
Altitude Shock Test	NAS8-2456 ITP 19600 PTP 12792-15

Test Conducted By: U. S. Science Corp. Date 9/22/61

J. Thompson

Test Technician

Test Certified By: M. A. LaVere Date 9/25/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 3 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 13

1.1 The unit, with the probe extended, shall be connected by any suitable means to a chamber whose internal volume is fifteen times greater than the unused portion of the retraction housing. A bleed valve shall be inserted into the interconnecting lines between the chamber and the unit. With the bleed valve closed, the pressure in the chamber shall be reduced to 0.0855 inches of water. The bleed valve shall then be opened and the vacuum pump shall continue to run until a pressure equivalent to 0.0856 inches of water has been achieved. The time required to meet this requirement shall be noted. The bleed valve shall then be closed and the retraction housing shall be vented to the atmosphere as quickly as possible. The unit shall then be subjected to the test requirements of ITP 19600 and * PTP 12791-15.

* Refer to page 42 of this report.

2.0 Procedure:

2.1 The unused portion of the retraction housing was approximated to be 270 cubic inches. A standard commercial high pressure nitrogen bottle was obtained and its internal volume was approximated at 2300 cubic inches. As this volume did not represent the required fifteen times volume of the unused portion of the retraction housing, permission to deviate from the specification requirements in this respect was requested and granted by the resident NASA representative.

2.2 The nitrogen bottle was suitably modified for use as a vacuum chamber. An additional plate and probe chamber was fabricated for adaption of the retraction housing to the test requirements. This fixture was attached to the forward face plate of the retraction housing.

2.3 Figure 1 of this test report illustrates the test set up.

2.4 The completed set up was connected to a vacuum pump. The operational specifications of the pump indicated that the required degree of pressure could be achieved. The bleed valve was closed and the pump energized. To partially compensate for the smaller vacuum chamber volume, the pressure was reduced to 0.0530 inches of water. The initial evacuation required 110 minutes to achieve. A Stokes gauge was used to monitor the internal pressure. Since this gauge is graduated in microns, the readings have been converted to inches of water to conform with the terminology of the test requirements. The bleed valve was opened and the

Test Engineer Test Engineer

USSC FF M 20

Unit Retractable Probe Date

Serial No. 107 Test No. 3 Run No. Proj. Engineer

pump continued to operate until stabilization occurred. Stabilization was achieved at a gauge indication of 2300 microns (1.238 inches of water) in 45 minutes. Additional pumping for 60 minutes resulted in a further reduction to only 2200 microns (1.183 inches of water). It was apparent that maximum vacuum, for this set up, had been achieved. Obvious leakage was not apparent and it was reasoned that either minute, undetectable leaks existed or that moisture in the chamber prevented further reduction of pressure.

2.5 The total time required from "bleed valve" opening to stabilization was 105 minutes. The "bleed valve" was again closed and the retraction housing vented to the atmosphere as quickly as possible. This was accomplished through the removal of a vent cap which terminated the vent line.

2.6 After completing the test requirements, the unit was subjected to a thorough visual inspection to ascertain if damage had occurred as a result of decompression and recompression. The unit was then subjected to the requirements of ITP 19600, and a data sheet indicating the results of these tests follows the text of this report.

3.0 Conclusions:

3.1 There was no evidence of physical damage to either the retraction housing nor the transducer housing as a result of this test. The test data sheet which follows indicates that the unit was capable of complying with all of the provisions of ITP 19600 except Air Jet Calibration. Statements concerning Air Jet Calibration are contained in the "Conclusion" section of Test Report No. 1.

Test Engineer Test Engineer

USSC FF W 20

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 3 Run No. Proj. Engineer

Test Equipment

Vacuum Pump, Cenco, Hy Vac No. 2
Vacuum Gauge, Stokes, 276 AA
Vent Tank, Airco, Special Design
Adaptor Plate, USSC, Special Design
Tubing, fittings, dux seal, as required
Wind Tunnel, Chrysler Corp. No. 10313088B
Static and Dynamic Test Console, Chrysler Corp., No. 10313089A
Stop Watch, Jaquet, (No part number given)

Test Engineer Test Engineer

USSC FT 4 20

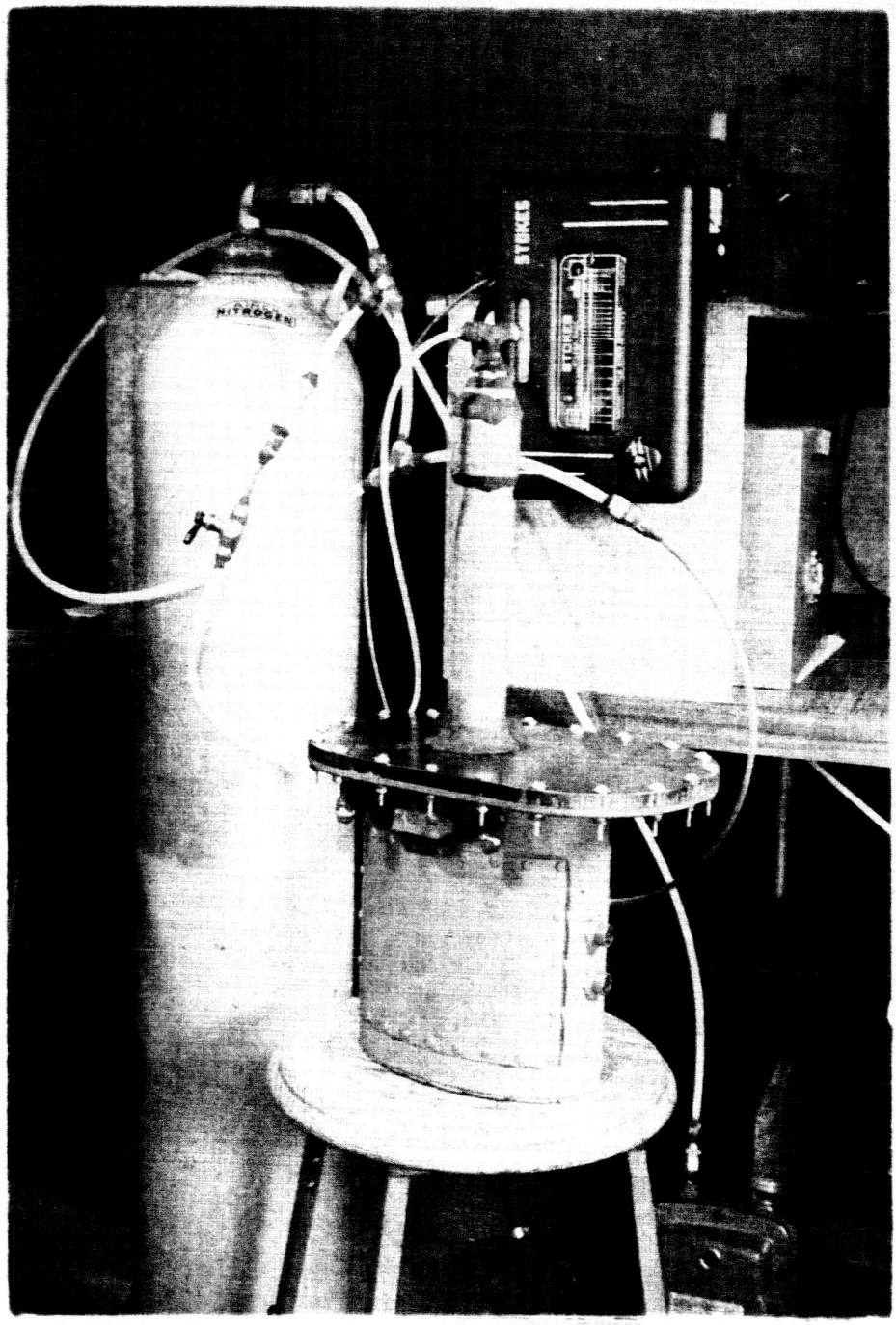


FIG. 1 ALTITUDE SHOCK TEST

ALTITUDE SHOCK TEST DATA SHEET
17409

DATE 25 SEPT. 61

S/N 107

TEST	INSTRUCTIONS	STAMP
1. Megger	(Green portion of insulation resistance scale)	acc Pass
2. Zero	(Meter can be zeroed)	acc Pass
3. Linearity	(Green portion of linearity scale)	+14° acc Pass + 7° acc Pass - 7° acc Pass -14° acc Pass
4. Extend	(Maximum 15 seconds)	acc Pass
Retract	(Maximum 15 seconds)	acc Pass
5. Phase Lag	(15° maximum)	acc Pass
6. Noise	(Test ok lamp remains on)	acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Failed 110 lbs. acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Failed 110 lbs. acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)	acc Pass
	("on" when extended-"off" when retracted)	acc Pass
		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)	acc Pass

NOTES:

Tester C W Osborn

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF.

TEST REPORT NO. 4

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transmitter, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
Vibration	NAS8-2456 ITP 19600

Test Conducted By: J. Thompson, C. Arbeau, Test Technicians — Date 9/28/61, 9/29/61

Test Certified By: M. A. LaVere, Test Engineer — Date 9/29/61

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 4 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 11

The unit shall be mounted on a fixture which will enable all three mutually perpendicular axes to be tested in sequence, with a simulated air stream of 150 knots passing over the probe.

a. Scan the frequency range from 20 to 2000 CPS in a time span of 10 minutes. Repeat twice observing all resonant points under the following conditions:

20 to 50 CPS at 2g.
50 to 110 CPS at .016 in. D. A. displacement.
110 to 2000 CPS at 10 g.

The unit shall be subjected to the above scan for the three mutually perpendicular planes.

b. At any resonant frequencies encountered for a period of ten minutes in any of the three planes under the following conditions:

20 to 45 CPS at 1 g.
45 to 95 CPS at .01 in D. A. displacement.
95 to 2000 CPS at 5 g.

c. At the end of each resonant frequency test subject to tests specified in ITP 19600 and *PTP 12792-15.

*Refer to page 42 of this report.

2.0 Procedure:

2.1 The unit was securely fastened to the test fixture and the test fixture was installed on the vibration table. The fixture was orientated so that the longitudinal axis of the probe and the "long" dimension of the retraction housing front face plate were perpendicular to the direction of vibration. For purposes of identification, this set up was termed "vertical plane." Figure 1 of this test report depicts this set up. The vibration control console was programmed to produce a frequency sweep from 20 to 2000 CPS in a period of approximately 10 minutes. The return sweep to 20 CPS took an additional 10 minutes making a total vibratory period of 20 minutes. During the cycling, resonance was noted at approximately 200 CPS. After completing the search for resonance phase, the unit was subjected to an additional 10 minutes of vibration at a fixed frequency

Test Engineer Test Engineer

USSC FORM 20

Unit Retractable Probe Date

Serial No. 107 Test No. 4 Run No. Proj. Engineer

of 200 CPS and at an applied force of 5 g. During the entire sequence a constant flow of air, equivalent to approximately 150 knots, was directed at the probe slots in accordance with the requirement. At the conclusion of the "vertical plane" vibration sequence, the unit was removed from the fixture and was subjected to the test provisions of ITP 19600.

2.2 After concluding the above tests, the unit was returned to the test fixture. The fixture was fastened to the vibration table so that the longitudinal axis of the probe was parallel to the direction of vibration. For purposes of identification, this set up was termed "horizontal plane". Figure 2 of this report depicts this set up. The vibration control console was programmed to produce a frequency sweep from 20 to 2000 CPS in a period of approximately 10 minutes. The return sweep to 20 CPS took an additional 10 minutes making a total vibratory period of 20 minutes. During the cycling, slight resonance was noted at 600 CPS. After completing the search for resonance phase, the unit was subjected to an additional 10 minutes of vibration at a fixed frequency of 600 CPS and at an applied force of 5 g. During the entire sequence a constant flow of air, equivalent to approximately 150 knots, was directed at the probe slots in accordance with the requirement. At the conclusion of the "horizontal plane" vibration sequence, the unit was removed from the fixture and was subjected to the test provisions of ITP 19600.

2.3 After concluding the above tests, the unit was returned to the test fixture. The fixture was fastened to the vibration table so that the longitudinal axis of the probe was perpendicular and the retraction housing front face plate was parallel to the direction of vibration. For purposes of identification this set up was termed "lateral plane". Figure 3 of this test report depicts this set up.

The vibration control console was programmed for a frequency sweep of 20 to 2000 CPS in a period of approximately 10 minutes. The return sweep to 20 CPS took an additional 10 minutes making a total vibratory period of 20 minutes. During the cycling severe resonance was observed at 180 CPS. The search for resonance was completed and the unit was then subjected to an additional vibratory period at the noted resonant frequency. The required time specified for this period is 10 minutes. After approximately eight minutes of resonance vibration excessive probe movement was observed. The test was stopped and the unit was removed from the test fixture. Disassembly of the inspection covers from the retraction housing revealed the following:

a. Retainers, USSC part no. 17423, worked loose from lead screw spring housings.

Test Engineer Test Engineer

Unit Retractable Probe Date

Serial No. 107 Test No. 4 Run No. Proj. Engineer

b. Potentiometer flex leads severed at potentiometers R101 and R102 wiper arms.

c. Front plate dowel pins USSC part no. 17440 jarred loose by excessive transducer movement resulting from item a.

A photograph depicting the above conditions appears as Figure 5 of this test report. It was the decision of the resident NASA representative that the unit be reworked as required, and the "lateral plane" portion of the vibration test be repeated. During re-assembly of the dowel pins and spring retainers, Loctite, type grade H was employed as a sealant. It was believed that the use of this product would prevent a recurrence of the previous result.

2.4 During rerun, severe resonance was observed at 200 CPS. After approximately one minute at this frequency, the dowel pins again jarred loose. The test was stopped and the unit was removed from the fixture. Inspection indicated that the dowel pin holes had been elongated. This condition apparently resulted from excessive transducer movement during the first test.

To facilitate further testing, replacement of the retraction housing front plate, USSC Part No. 17416 was performed. Replacement was approved by the resident NASA representative providing all phases of the vibration test were repeated.

2.5 Prior to retesting, the repaired unit was subjected to the test provisions of ITP 19600.

Retest was thereupon performed in the "vertical", "horizontal" and "lateral" planes in accordance with the test requirements. Resonant points were noted at 200 CPS in the "vertical" plane, 480 CPS in the "horizontal" plane, and at 195 CPS in the "lateral" plane. Additional vibration at these frequencies, for the prescribed time, was accomplished. Testing to ITP 19600 was performed following each vibratory phase. Data sheets indicating the results of these tests follows the text of this report.

2.6 Satisfactory performance was achieved and no further component loosening nor structural failures resulted from retesting.

All phases of the vibration test were witnessed by the resident NASA representative.

Test Engineer Test Engineer

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 4 Run No. Proj. Engineer

3.0 Conclusions:

The use of Loctite or similar adhesive to secure clamp nuts is necessary to assure structural integrity during stress of vibratory environments.

Removal of the retraction housing inspection covers and face plate to accomplish the repair described above resulted in a loss of seal integrity. As indicated on subsequent data sheets, the unit did not meet the leak test requirements of ITP 19600. It was concluded, however, that seal integrity would have been maintained had disassembly not been necessary. The unit displayed capability in meeting the remaining test requirements with the exception of Air Jet Calibration. Statements concerning Air Jet Calibration are contained in the "Conclusion" section of Test Report No. 1.

Test Engineer Test Engineer

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 4 Run No. Proj. Engineer

Test Equipment

Vibration Exciter, M. B. Model C25-HA
Vibration Power Amplifier, Ling Model PP 20/20-C
Vibration Control Console, Ling S11-D
Air pressure gauge 0-100 PSI, Ashcroft (No Part No.)
Test Fixture, USSC Special Design
Air Flow Fixture, USSC Special Design
Power Supply, 28 VDC, Perkin MR 532-15A
Strobe Light, General Radio 1531A
Wind Tunnel, Chrysler Corp. No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. No. 10313089A
Stop Watch, Jaquet, (No part number given)

Test Engineer Test Engineer

USSC FF M 20

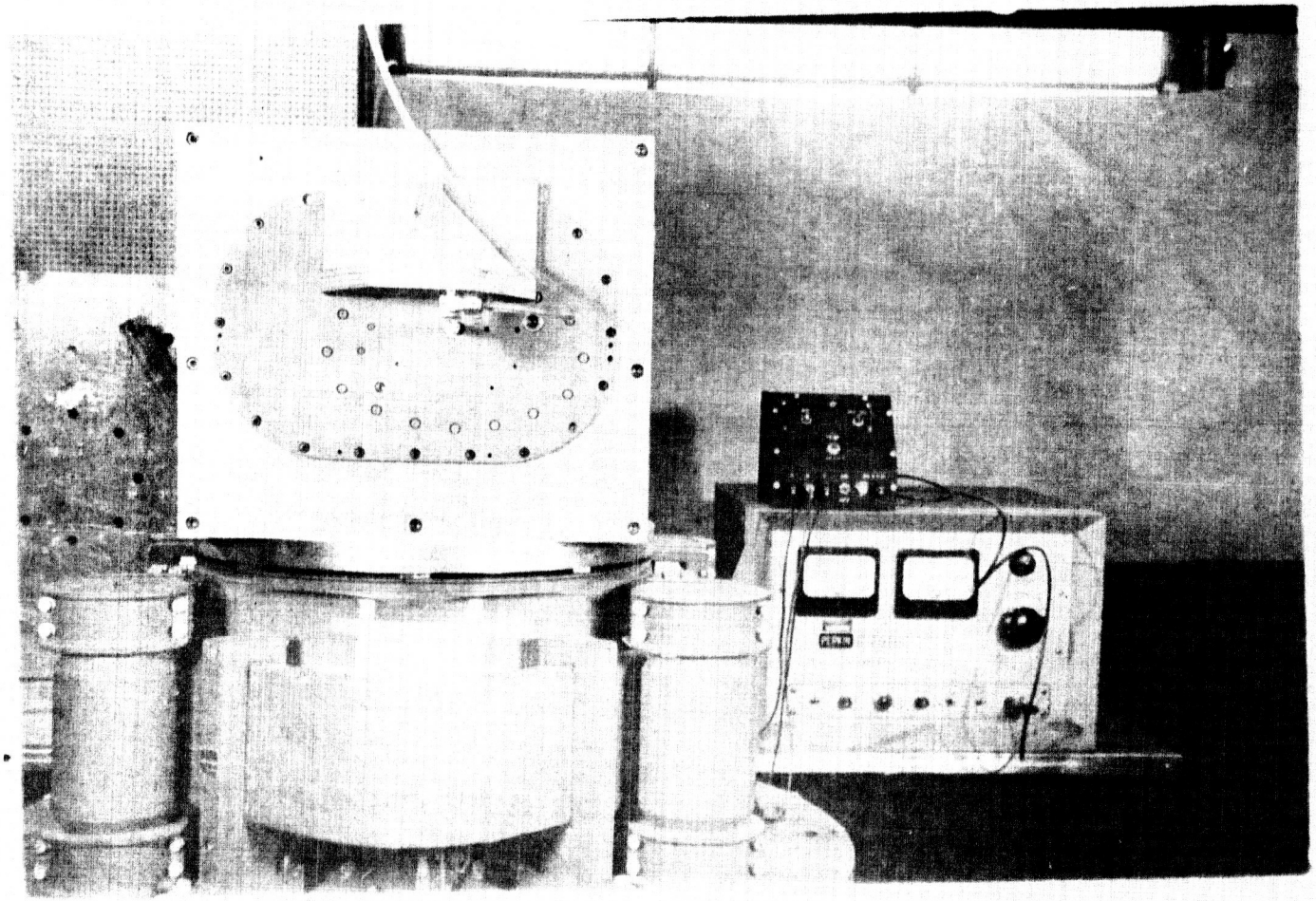


FIG. 1 VIBRATION TEST
VERTICAL PLANE

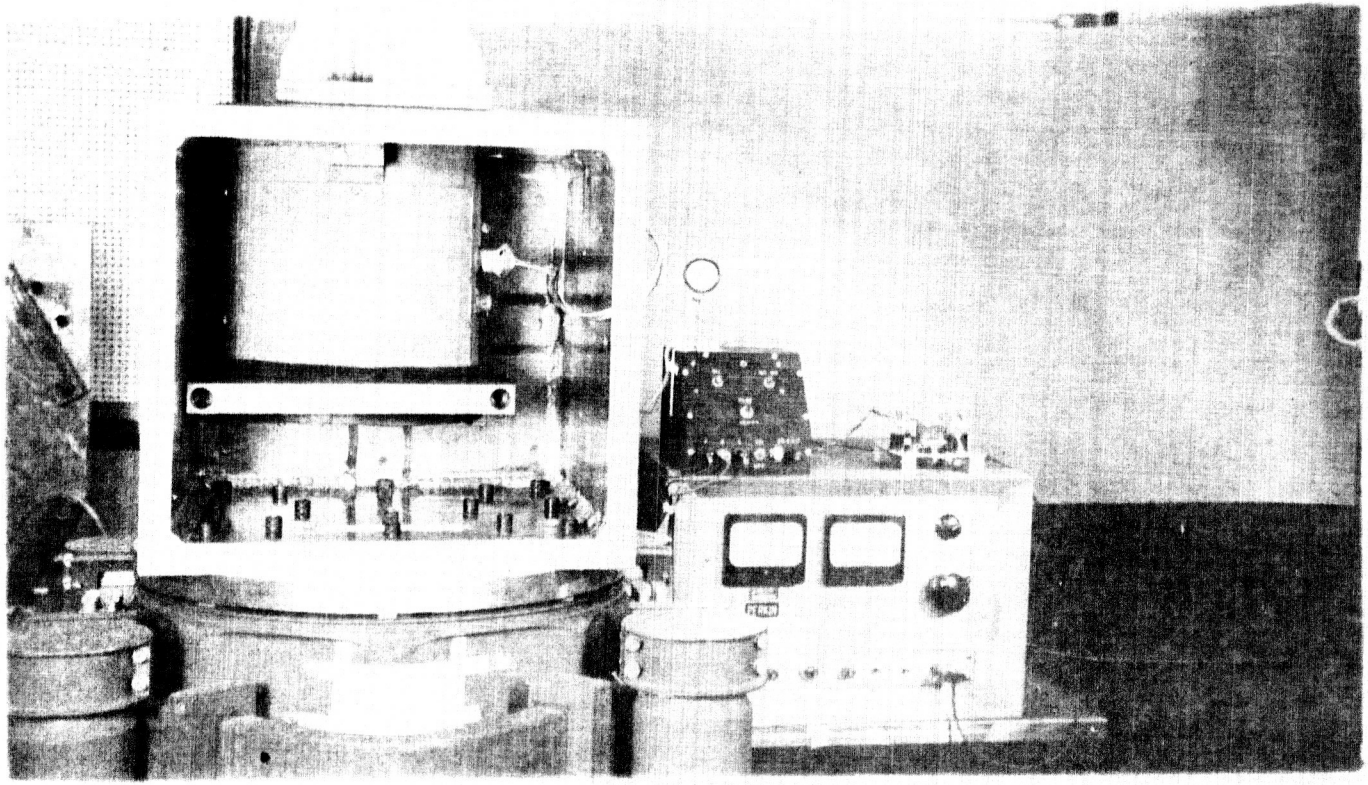


FIG. 2 VIBRATION TEST
HORIZONTAL PLANE

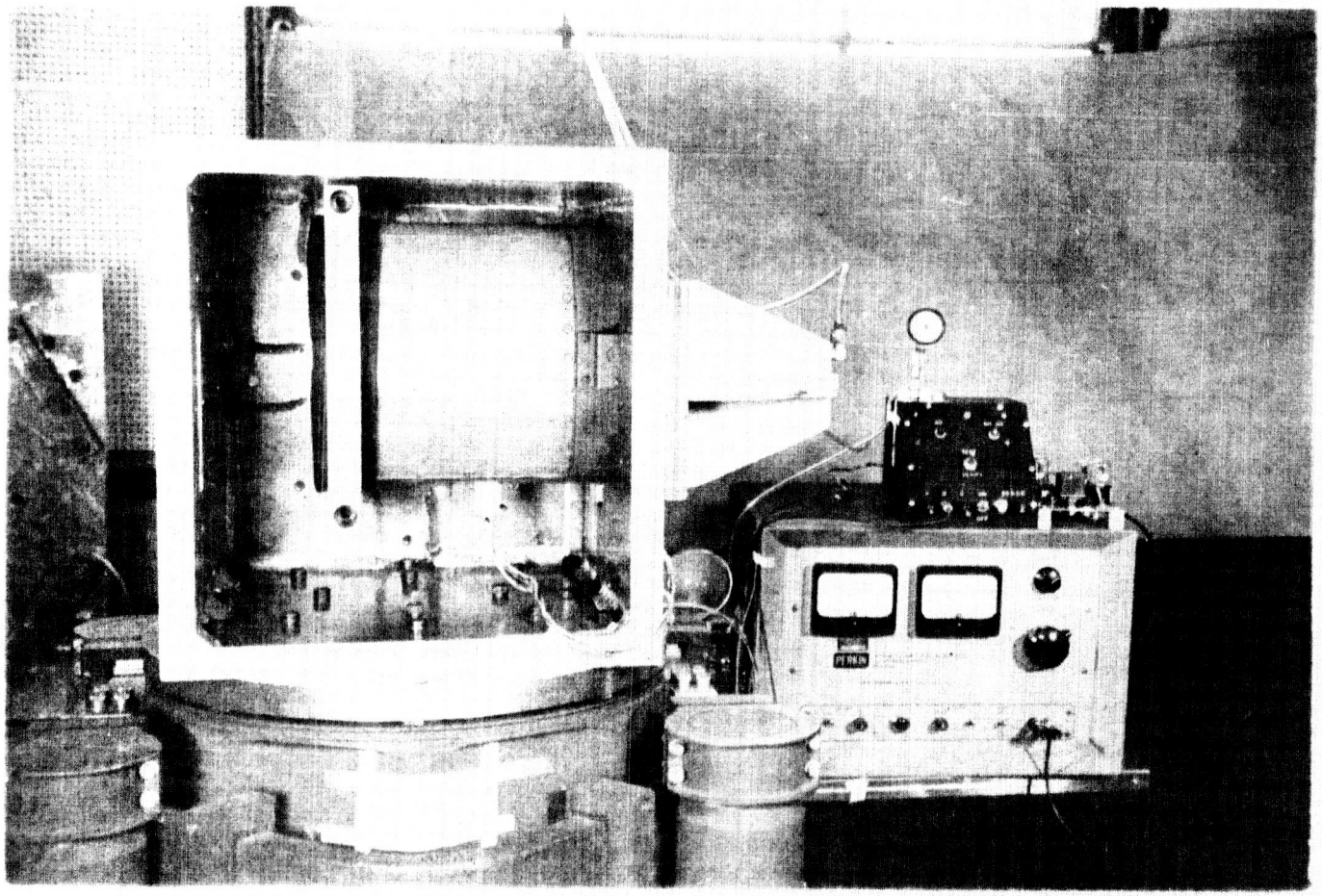


FIG. 3 [illegible] TEST
[illegible] PLANE

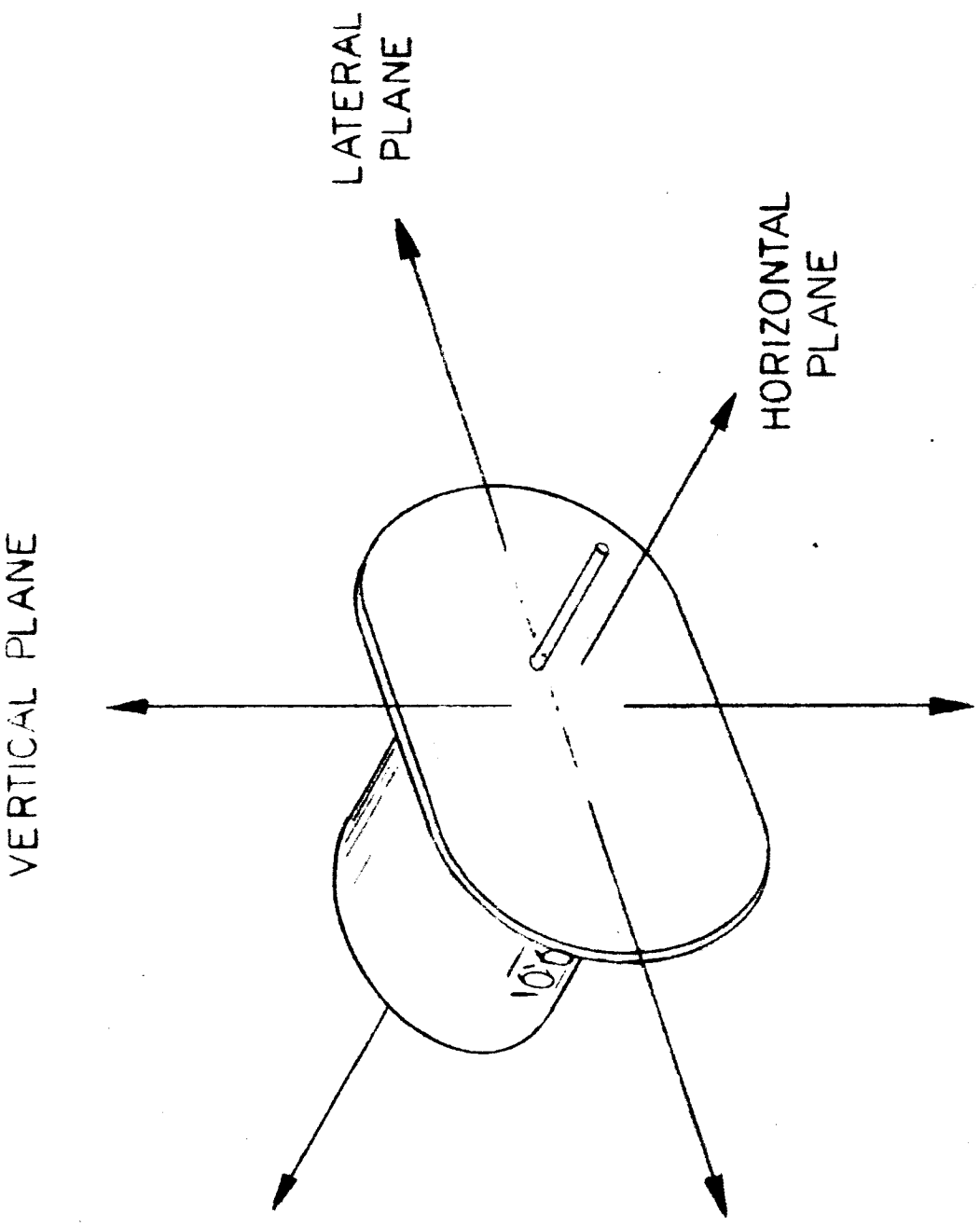


FIGURE 4. VIBRATION PLANE IDENTIFICATION

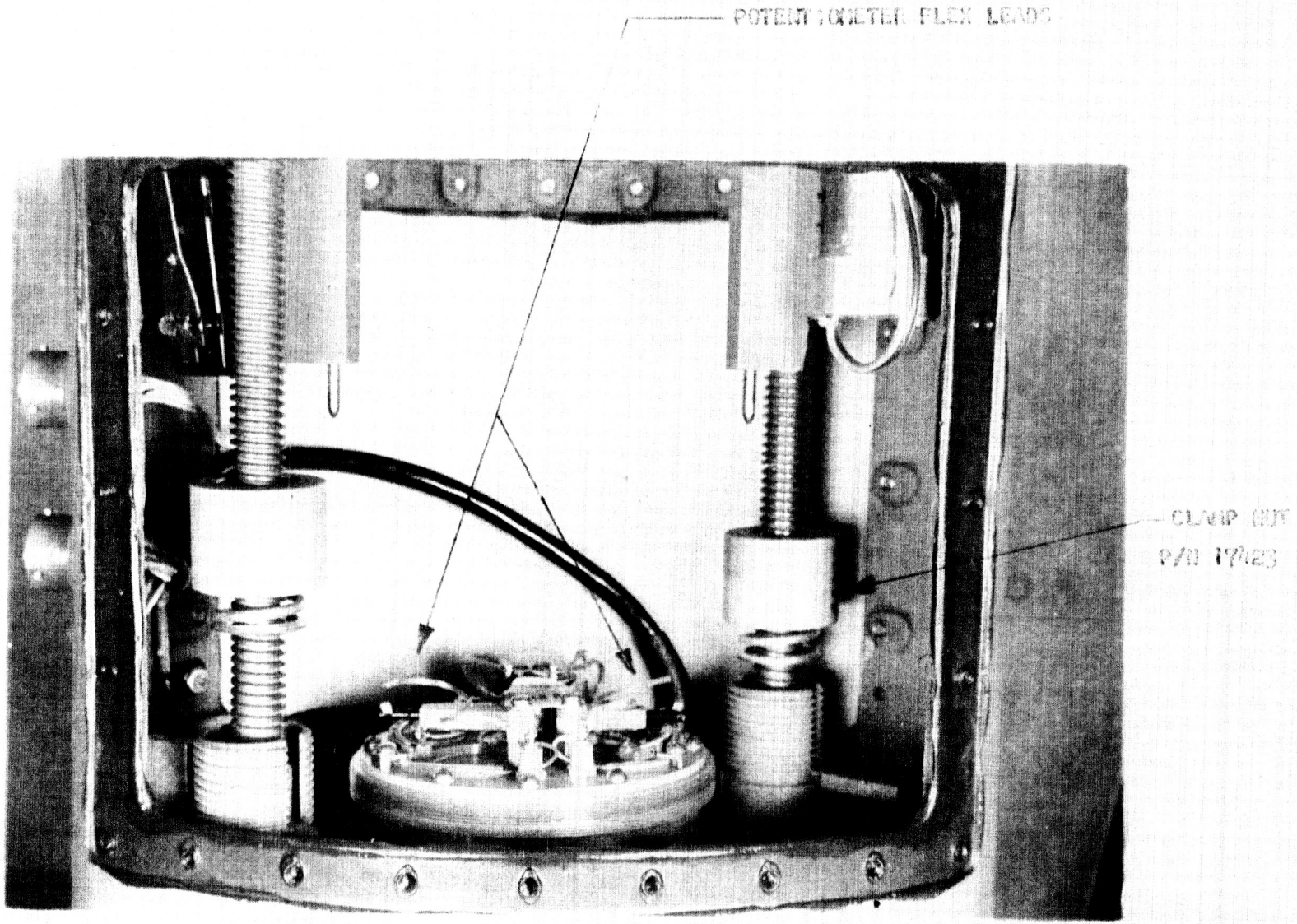


FIG. 5 POST VIBRATION TEST
INTERNAL VIEW OF UNIT

VIBRATION TEST
VERTICAL PLANE

DATA SHEET
17409

DATE 29 SEPT. 61

S/N 107

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Failed

NOTES:

Tester C W Arbeau

VIBRATION TEST
HORIZONTAL PLANE

DATA SHEET
17409

DATE 28 SEPT. 61

S/N 107

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration +	(Meter deflects to left of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
-	(Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass
			acc Failed

NOTES:

Tester C W Arbeau

VIBRATION TEST
LATERAL PLANE

DATA SHEET
17409

DATE 28 SEPT. 61

S/N 107

TEST	INSTRUCTIONS	STAMP
1. Megger	(Green portion of insulation resistance scale)	acc Pass
2. Zero	(Meter can be zeroed)	acc Pass
3. Linearity	(Green portion of linearity scale)	+14° acc Pass + 7° acc Pass - 7° acc Pass -14° acc Pass
4. Extend	(Maximum 15 seconds)	acc Pass
Retract	(Maximum 15 seconds)	acc Pass
5. Phase Lag	(15° maximum)	acc Pass
6. Noise	(Test ok lamp remains on)	acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Failed 110 lbs. acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Failed 110 lbs. acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)	acc Pass
	("on" when extended-"off" when retracted)	acc Pass
		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)	acc Failed

NOTES:

Tester C W Arbeau

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF.

TEST REPORT NO. 5

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. | Part No. 10000070 | S/N 113

Test	Specification
Rain	NAS8-2456 ITP 19600

Test Conducted By: Rototest Labs — Date 9/28/61

Subcontract Test Facility

C. Arbeau
Test Technician

Test Certified By: M. A. LaVere — Date 9/28/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 5 Run No. Proj. Engineer

1.0 Introduction:

1.1 As adequate equipment for conducting the Rain test in accordance with the test requirements was not available at U. S. Science Corporation, the test was performed at:

Rototest Laboratories
2803 Los Flores Blvd.
Lynwood, California

1.2 The test was performed under the direction of a U. S. Science Corporation test engineer. A copy of the certified test report, Rototest Report No. 3276 (3) follows.

1.3 Required tests per ITP 19600 were conducted at U. S. Science Corporation facilities at the conclusion of the Rain test. A test data sheet indicating the results of these tests follows the text of this report.

1.4 Testing to PTP 12792-15 was not accomplished. Elimination of this requirement was agreed upon and reference to page 42 of this report is made.

Test Engineer Test Engineer

USSC FC M 20

Service To:	Report No. 3276
U. S. SCIENCE CORPORATION 5221 WEST 102ND STREET LOS ANGELES 45, CALIF.	Purchase Order No. 1-108978 Contract No. -- Date NOVEMBER 1, 1961

CERTIFIED TEST REPORT

ENVIRONMENTAL TESTING

OF

TRANSDUCER,

ANGLE OF ATTACK WITH RETRACTABLE PROBE

rototest laboratories
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

COUNTY OF LOS ANGELES) SS
STATE OF CALIFORNIA)

VERN L. SANDBERG, LABORATORY SUPERVISOR,

being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Vern L. Sandberg

SUBSCRIBED and sworn to before me this 1ST day of NOVEMBER 1961

Ruby T Archambault

Notary Public in and for the County of Los Angeles, State of California.
My commission expires OCTOBER 2 1962

Tests Conducted By:

HENRY BURMANN Henry Burm

EARL CHAPMAN Earl Chapman

ALBERT G. KLEINKNECHT Albert G. Kleinknecht

JAMES B. ROSE James B Rose by ds

WILLIAM J. KOLBERG William J Kolberg by ds

Certified By: Andrew McKendry
Quality Control Engineer

Form QC-11
1/1/59

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

ADMINISTRATIVE DATA

DATE: NOVEMBER 1, 1961

NAME OF PART: TRANSDUCER, ANGLE OF ATTACK WITH RETRACTABLE PROBE

PURPOSE OF TEST: ENVIRONMENTAL TESTING

MANUFACTURER: U. S. SCIENCE CORPORATION

MANUFACTURER'S TYPE OR PART NO.: 10000070

DRAWING, SPECIFICATION OR EXHIBIT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456 SCHEDULE

QUANTITY OF ITEMS TESTED: ONE (1) SAMPLE

SECURITY CLASSIFICATION OF ITEMS: UNCLASSIFIED

DATE TEST COMPLETED: NOVEMBER 1, 1961

TEST CONDUCTED BY: ROTOTEST LABORATORIES, INC.

DISPOSITION OF SPECIMENS: THE SAMPLE WAS RETURNED TO U. S. SCIENCE CORPORATION.

SIGNATURES:

Vern L. Sandberg
VERN L. SANDBERG
LABORATORY SUPERVISOR

ABSTRACT:

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

TABLE OF CONTENTS

Test Number	Title of Test	Page
	Introduction	0.2
1.	Acceleration	1.0
2	Dynamic Shock	2.0
3.	Rain	3.0
4.	Humidity	4.0
5.	Salt Spray	5.0
6.	Sand and Dust	6.0

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION

REFERENCE: U. S. SCIENCE CORPORATION PURCHASE ORDER NO. 1-108978; U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456; ROTOTEST LETTER DATED SEPTEMBER 8, 1961

REQUIREMENT: TO PERFORM ENVIRONMENTAL TESTING IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AS FOLLOWS:

TEST NUMBER	TITLE OF TEST	SAMPLE	U. S. SCIENCE CONTRACT NO. NAS8-2456 PARAGRAPH
1.	ACCELERATION	1	10
2.	DYNAMIC SHOCK	1	12
3.	RAIN	1	18
4.	HUMIDITY	1	14
5.	SALT SPRAY	1	15
6.	SAND AND DUST	1	16

GENERAL TEST INFORMATION

SAMPLE MOUNTING

THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS.

SAMPLE IDENTIFICATION

MFG. PART NO.	SERIAL NO.	ROTOTEST SAMPLE NO.
1000978	113	1

ELECTRICAL MEASUREMENTS

ALL INSTRUMENTS AND AUXILIARY APPARATUS USED, WITH MANUFACTURER'S NAME, MODEL OR TYPE NUMBER AND SERIAL NUMBER ARE DESCRIBED IN THE INDIVIDUAL EQUIPMENT LISTS. ALL ELECTRICAL METERS HAVE BEEN CALIBRATED BY THE QUALITY ELECTRIC COMPANY OF LOS ANGELES AT APPROXIMATELY SIX MONTH INTERVALS. TEST INSTRUMENTS HAVE BEEN CALIBRATED BY QUALIFIED INDEPENDENT FACILITIES AT APPROXIMATELY 12 MONTH INTERVALS.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION - CONTINUED

GENERAL TEST INFORMATION: - CONTINUED

ADDITIONAL INFORMATION

ROTOTEST LETTER DATED SEPT. 8, 1961

"1. U. S. SCIENCE WILL SUPPLY A SUITABLE FIXTURE FOR THE ACCELERATION AND SHOCK TESTS.

2. THE UNIT WILL BE RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING."

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

3. RAIN

SAMPLE 1

REFERENCE: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, PARAGRAPH 18

REQUIREMENT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456

"18. RAIN: A. THIS TEST IS TO BE PERFORMED IN ACCORDANCE WITH MIL-T-19229A, PARAGRAPH 4.6.19.

B. THE UNIT SHALL BE TESTED PER ITP 19600 AND PTP 12792-15."

PROCEDURE: THE SAMPLE WAS TESTED IN ACCORDANCE WITH THE PRECEDING REQUIREMENTS.

EQUIPMENT:

TO MEASURE	SYMBOL	UNIT	APPARATUS
AMBIENT TEMPERATURE	TA	°C	MERCURY THERMOMETER, -10/110 x 1°C
AIRSPEED	VA	INCH OF WATER	MERIAM MANOMETER (WATER) MODEL 5000, S.N. E-2902, 12-0-12 x 0.1 INCH (AIRSPEED FOUND FROM DIFFERENTIAL PRESSURE EXPRESSED AS INCHES OF WATER; DATA TAKEN FROM ANA BULLET NO. 418).
RAIN	--	INCH/HR.	ABSOLUTE CALIBRATION
DURATION OF TEST	T	MINUTE	STANDARD STOP WATCH, 0/30 MINUTES x 1 SECOND

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

3. RAIN - CONTINUED

RESULTS:

DATE 1961	TA °C	VA INCH OF WATER	RAIN INCH/HR.	T MINUTE	SAMPLE	COMMENT
		7.9 (110KT)	0.8 (AT PROBE)	15	1	SPECIFIED
9/25	26	7.9*	0.8	15	1	NO VISIBLE PHYSICAL DAMAGE; PERFORMANCE TESTING DONE BY U. S. SCIENCE PERSONNEL AT THEIR FACILITY.

* EQUIVALENT OF 110 KNOTS AIRSPEED.

CONCLUSIONS: NO CRITERION WAS GIVEN, THEREFORE NO CONCLUSIONS CAN BE DRAWN.

WILLIAM J. KOLBERG

10/2/61
DH

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 5 Run No. Proj. Engineer

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1.

3.2 It can be concluded that the unit is capable of satisfactory operation after exposure to heavy rain.

Test Engineer Test Engineer

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 5 Run No. Proj. Engineer

Additional Test Equipment

Wind Tunnel, Chrysler Corp., Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp., Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

USSC FORM 20

FIG. 1 LAB TEST

RAIN TEST

DATA SHEET
17409

DATE 28 SEPT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration +	(Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
-	(Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass

NOTES:

Tester J W Adams

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST REPORT NO. 6

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	

Unit: Probe, Retractable, Transmitter, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
Low Temperature Exposure	NAS8-2456

Test Conducted By: J. Thompson — Date 10/2/61
Test Technician

Test Certified By: M. A. LaVere — Date 10/2/61
Test Engineer

USSC FORM 15

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 6 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 5

1.1 "The unit shall be placed in a test chamber and mounted such as to allow the operation of the retracting mechanism. The chamber temperature shall be reduced to -54°C (-65°F) for a period of 48 hours. Perform visual examination."

2.0 Procedure:

2.1 The unit, with probe extended, was installed in the test chamber. Thermocouples were installed as follows:

Thermocouple No. 1: Adjacent to probe and used to monitor chamber air temperature.

Thermocouple No. 2: On retraction housing side cover near front face plate, and used to monitor unit temperature.

2.2 Figure 1 of this test report depicts the test set up.

2.3 At 1700 hours, 2 October 1961, the test commenced. The chamber air was reduced to the required temperature. The chamber temperatures were monitored throughout the test.

2.4 At the conclusion of the test on 4 October 1961 at 1130 hours, the unit was visually inspected.

3.0 Conclusions:

3.1 There was no apparent physical deterioration (e.g., shifts in alignment, gasket swelling or finish damage) as a result of the exposure. It can be concluded that long period storage at low temperature will not physically affect the unit.

Test Engineer Test Engineer

USSC FC M 20

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 6 Run No. Proj. Engineer

Test Equipment

Temperature Chamber, Bemco, DF 100/650-1
Thermocouple Bridge, Leeds and Northrup, Model 8658

Test Engineer Test Engineer

Fig. 1 [illegible] TEST

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45 CALIF.

TEST REPORT NO. 7

OF

Qualification Test Report, QTR 10000070

Customer NASA

USSC Job No. 124-004

Customer P.O. _____

Contract No. NAS8-2456

Customer Specs NAS8-2456

USSC Specs PTP 19600

Unit Probe, Retractable, Transmitter, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
Low Temperature Operation	NAS8-2456 ITP 19600

Test Conducted By: J. Thompson — Date 10/4/61

C. Arbeau — 10/5/61

Test Technician

Test Certified By: M. A. LaVere — Date 10/5/61

Test Engineer

SSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 7 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 6

1.1 "Raise chamber temperature from that shown in paragraph 5 to -17° ±1°C (0°F)and allow to stabilize for a period of 4 hours.

a. Test

1. The extend switch shall be engaged and the time to extend tabulated.

2. The retract switch shall then be engaged and the time to retract tabulated.

3. Repeat the tests of 1 and 2 five times.

4. Return units to room ambient conditions and perform tests specified in ITP 19600 and *PTP 12792-15.

*Refer to page 42 of this report.

2.0 Procedure:

2.1 The unit with probe extended was installed in the temperature chamber.

Thermocouples were placed as follows:

Thermocouple No. 1 - Adjacent to probe. Used to monitor chamber air temperature.

Thermocouple No. 2 - On unit side cover near front plate of retraction housing. Used to monitor unit temperature.

2.2 At 1200 hours, 4 October 1961, the unit temperature stabilized at -17 ±1°C (0°F). This temperature was maintained for 4 hours. At the conclusion of the 4 hour period, the probe actuating mechanism was energized. The time required for extension and retraction are tabulated below:

	Cycle No.			
	1	2	3	4
Extend Time (secs.)	10	10	10	10
Retract Time (secs.)	10	10	10	10

Test Engineer Test Engineer

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 7 Run No. Proj. Engineer

2.3 Chamber and unit were returned to laboratory ambient conditions. The unit was subjected to the requirements of ITP 19600.

3.0 Conclusions:

3.1 The unit met all requirements of ITP 19600 except Air Jet Calibration. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1. It is further concluded that the probe actuating mechanism performs within specification limits at low temperature.

Test Engineer Test Engineer

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 7 Run No. Proj. Engineer

Test Equipment

Temperature Chamber, Bemco Model DF100/650-1
Thermocouple Bridge, Leeds and Northrup Model 8658
Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part or model number shown)

Test Engineer Test Engineer

USSC FORM 20

LOW TEMPERATURE EXPOSURE & OPERATION TEST

DATA SHEET
17409

DATE 5 Oct 61

S/N 107

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass
			acc Failed

NOTES:

Tester [signature]

U.S. SCIENCE CORPORATION
5721 W. 102ND STREET
LOS ANGELES 45 CALIF.

TEST REPORT NO. 8

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 113

Test	Specification
Acceleration	NAS8-2456 ITP 19600

Test Conducted By: Rototest Labs — Date 10/3/61

Subcontract Test Facility

C. Arbeau

Test Technician

Test Certified By: M. A. LaVere — Date 10/3/61

Test Engineer

USSC FORM 15

Unit Retractable Probe Date

Serial No. 113 Test No. 8 Run No. Proj. Engineer

1.0 Introduction:

1.1 As adequate equipment for conducting the Acceleration test in accordance with the test requirements was not available at U. S. Science Corporation, the test was performed at:

Rototest Laboratories
2803 Los Flores Blvd.
Lynwood, California

1.2 The test was performed under the direction of a U. S. Science Corporation test engineer. A copy of the certified test report, Rototest Report No. 3276 (1) follows.

1.3 Required tests per ITP 19600 were conducted at U. S. Science Corporation facilities at the conclusion of the Acceleration test. A test data sheet indicating the results of these tests follows the text of this report.

1.4 Testing to PTP 12792-15 was not accomplished. Elimination of this requirement was agreed upon and reference to page 42 of this report is made.

Test Engineer Test Engineer

Service To:	Report No. 3276
U. S. SCIENCE CORPORATION 5221 WEST 102ND STREET LOS ANGELES 45, CALIF.	Purchase Order No. 1-108978 Contract No. -- Date NOVEMBER 1, 1961

CERTIFIED TEST REPORT

ENVIRONMENTAL TESTING

OF

TRANSDUCER,

ANGLE OF ATTACK WITH RETRACTABLE PROBE

rototest laboratories
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

COUNTY OF LOS ANGELES) SS
STATE OF CALIFORNIA)

VERN L. SANDBERG, LABORATORY SUPERVISOR

being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Vern L. Sandberg

SUBSCRIBED and sworn to before me this 1st day of NOVEMBER 1961

Ruby T Archambault

Notary Public in and for the County of Los Angeles, State of California.
My commission expires OCTOBER 2, 1962

Tests Conducted By:

HENRY BURMANN Henry Burmann

EARL CHAPMAN Earl Chapman

ALBERT G. KLEINKNECHT Albert G. Kleinknecht

JAMES B. ROSE James B Rose by Ls

WILLIAM J. KOLBERG William J Kolberg by Ls

Certified By: Andrew McKindry
Quality Control Engineer

Form QC-11
1/1/59

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

ADMINISTRATIVE DATA

DATE: NOVEMBER 1, 1961

NAME OF PART: TRANSDUCER, ANGLE OF ATTACK WITH RETRACTABLE PROBE

PURPOSE OF TEST: ENVIRONMENTAL TESTING

MANUFACTURER: U. S. SCIENCE CORPORATION

MANUFACTURER'S TYPE OR PART NO.: 10000070

DRAWING, SPECIFICATION OR EXHIBIT: U. S. SCIENCE CORPORATION CONTRACT No. NAS8-2456 SCHEDULE

QUANTITY OF ITEMS TESTED: ONE (1) SAMPLE

SECURITY CLASSIFICATION OF ITEMS: UNCLASSIFIED

DATE TEST COMPLETED: NOVEMBER 1, 1961

TEST CONDUCTED BY: ROTOTEST LABORATORIES, INC.

DISPOSITION OF SPECIMENS: THE SAMPLE WAS RETURNED TO U. S. SCIENCE CORPORATION.

SIGNATURES:

Vern L. Sandberg
VERN L. SANDBERG
LABORATORY SUPERVISOR

ABSTRACT:

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

TABLE OF CONTENTS

TEST NUMBER	TITLE OF TEST	PAGE
	INTRODUCTION	0.2
1.	ACCELERATION	1.0
2	DYNAMIC SHOCK	2.0
3.	RAIN	3.0
4.	HUMIDITY	4.0
5.	SALT SPRAY	5.0
6.	SAND AND DUST	6.0

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION

REFERENCE: U. S. SCIENCE CORPORATION PURCHASE ORDER NO. [illegible]-108978; U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, ROTOTEST LETTER DATED SEPTEMBER 8, 1961

REQUIREMENT: TO PERFORM ENVIRONMENTAL TESTING IN ACCORDANCE WITH THE ABOVE SPECIFICATION AS FOLLOWS:

TEST NUMBER	TYPE OF TEST	SAMPLE	U. S. SCIENCE CONTRACT NO. NAS8-2456 PARAGRAPH
1.	ACCELERATION	1	10
2.	DYNAMIC SHOCK	1	12
3.	RAIN	1	18
4.	HUMIDITY	1	14
5.	SALT SPRAY	1	15
6.	SAND AND DUST	1	16

GENERAL TEST INFORMATION

SAMPLE MOUNTING

THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS.

SAMPLE IDENTIFICATION

MFG. PART NO.	SERIAL NO.	ROTOTEST SAMPLE NO.
[illegible]	[illegible]	

MEASUREMENTS

ALL INSTRUMENTS AND AUXILIARY APPARATUS USED, WITH MANUFACTURER'S NAME, MODEL OR TYPE NUMBER AND SERIAL NUMBER ARE DESCRIBED IN THE INDIVIDUAL EQUIPMENT LISTS. ALL ELECTRICAL METERS HAVE BEEN CALIBRATED BY THE QUALITY ELECTRIC COMPANY OF LOS ANGELES AT APPROXIMATELY SIX MONTH INTERVALS. TEST INSTRUMENTS HAVE BEEN CALIBRATED BY QUALIFIED INDEPENDENT FACILITIES AT APPROXIMATELY 12 MONTH INTERVALS.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION - CONTINUED

GENERAL TEST INFORMATION: - CONTINUED

ADDITIONAL INFORMATION

ROTOTEST LETTER DATED SEPT. 8, 1961

"1. U. S. SCIENCE WILL SUPPLY A SUITABLE FIXTURE FOR THE ACCELERATION AND SHOCK TESTS.

2. THE UNIT WILL BE RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING."

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

1. ACCELERATION

SAMPLE 1

REFERENCE: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, PARAGRAPH 10

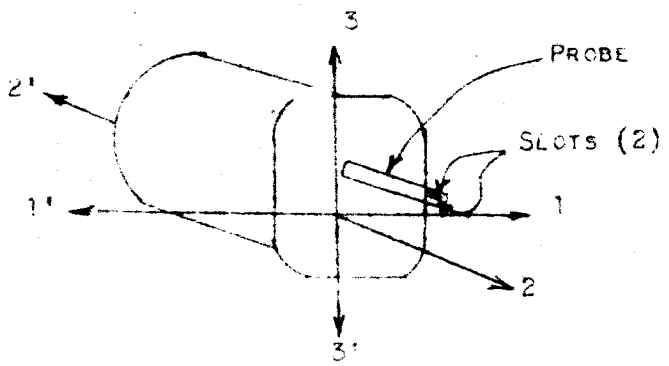
REQUIREMENT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456

"10. ACCELERATION: THE UNIT SHALL BE MOUNTED ON A FIXTURE SUCH THAT ACCELERATION CAN BE IMPARTED ALONG THE LINE OF FLIGHT ON THE C.G. OF THE TRANSDUCER AT 20 G FOR 5 MINUTES AND ON EACH OF THE OTHER TWO PLANES AND IN EACH DIRECTION AT 5 G FOR 5 MINUTES WITH THE PROBE EXTENDED.

A. TEST. AT THE CONCLUSION OF THE ABOVE TEST THE UNIT SHALL BE SUBJECTED TO THE ACCEPTANCE TEST OF ITP 19600 AND PTP 12792-15."

PROCEDURE: THE SAMPLE WAS TESTED IN ACCORDANCE WITH THE PRECEDING REQUIREMENT.

DEFINITION OF AXIS



rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

1. ACCELERATION - CONTINUED

EQUIPMENT:

TO MEASURE	SYMBOL	UNIT	APPARATUS
AMBIENT TEMPERATURE	TA	°C	MERCURY THERMOMETER, -15/150 x 1°C
RADIUS OF GYRATION	RAD G	INCH	STEEL SCALE, 0/20 x 1/8 INCH
CENTRIFUGE ROTATIONAL SPEED	N	RPM	BENDIX PACIFIC CENTRIFUGE, M 3944
ACCELERATION	G	GRAVITY	CALCULATED: $G = (28416 \times 10^{-9})(RAD\ G)(N)^2$
DURATION OF ACCELERATION	DA	MINUTE	STOP WATCH

RESULTS:

DATE 1961	TIME	TA °C	RAD G INCH	N RPM	G GRAVITY	DA MINUTE	AXIS	SAMPLE	COMMENT
					20, 5	5	SEE BELOW	1	SPECIFIED
10/3	10:30	60	76	97	20	5	1	1	ACCELERATED IN ONE DIRECTION ONLY.
	11:15		76	49	5	5	2		
	11:25		76	49	5	5	2'		
	11:40		76	49	5	5	3		
	11:50		76	49	5	5	3'		

VISUAL OBSERVATION

NO VISIBLE EVIDENCE OF PHYSICAL DAMAGE TO THE SAMPLE WAS OBSERVED.

NOTE: ELECTRICAL CHECK OUT WAS PERFORMED BY U. S. SCIENCE PERSONNEL.

CONCLUSIONS: SAMPLE 1 WAS NOT VISIBLY DAMAGED DURING ACCELERATION. THE SAMPLE WAS RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING.

HENRY BURMANN

10/5/61
DJ

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 8 Run No. Proj. Engineer

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1.

3.2 It can be concluded that the unit is capable of proper operation after exposure to linear acceleration.

Test Engineer Test Engineer

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 8 Run No. Proj. Engineer

Additional Test Equipment

Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

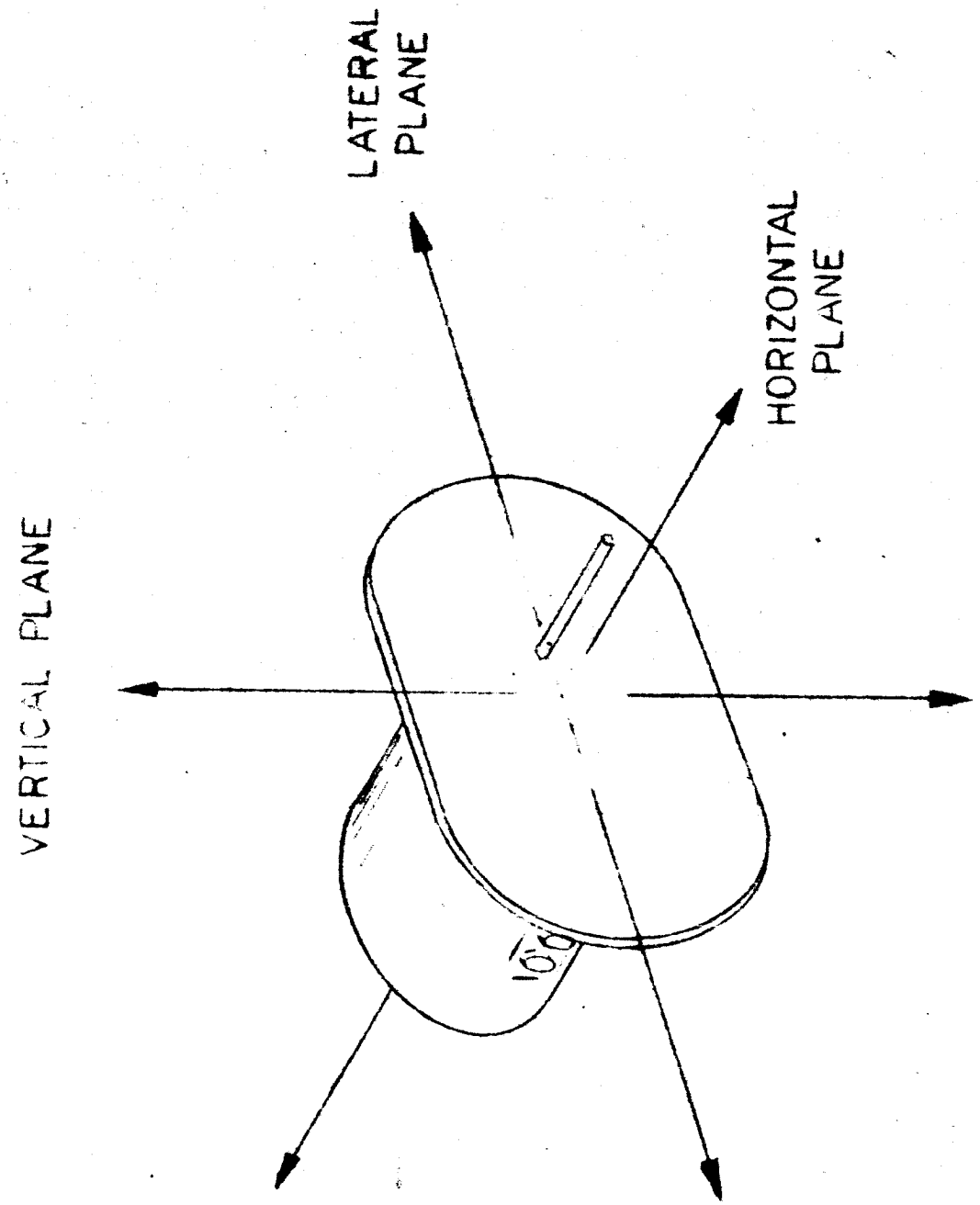


FIGURE 1. ACCELERATION PLANE IDENTIFICATION

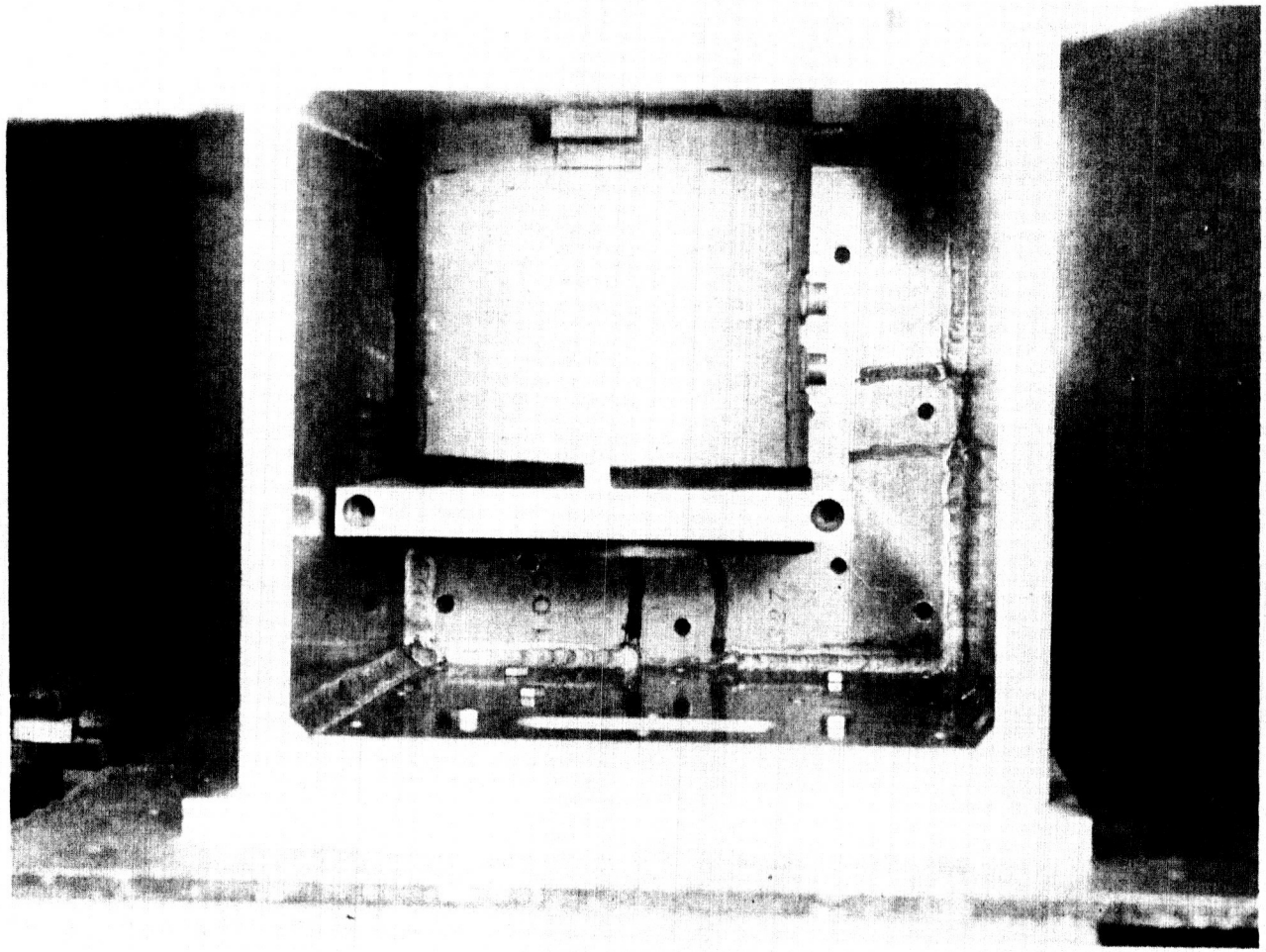


FIG. 3 ACCELERATION TEST

(HORIZONTAL PLANE

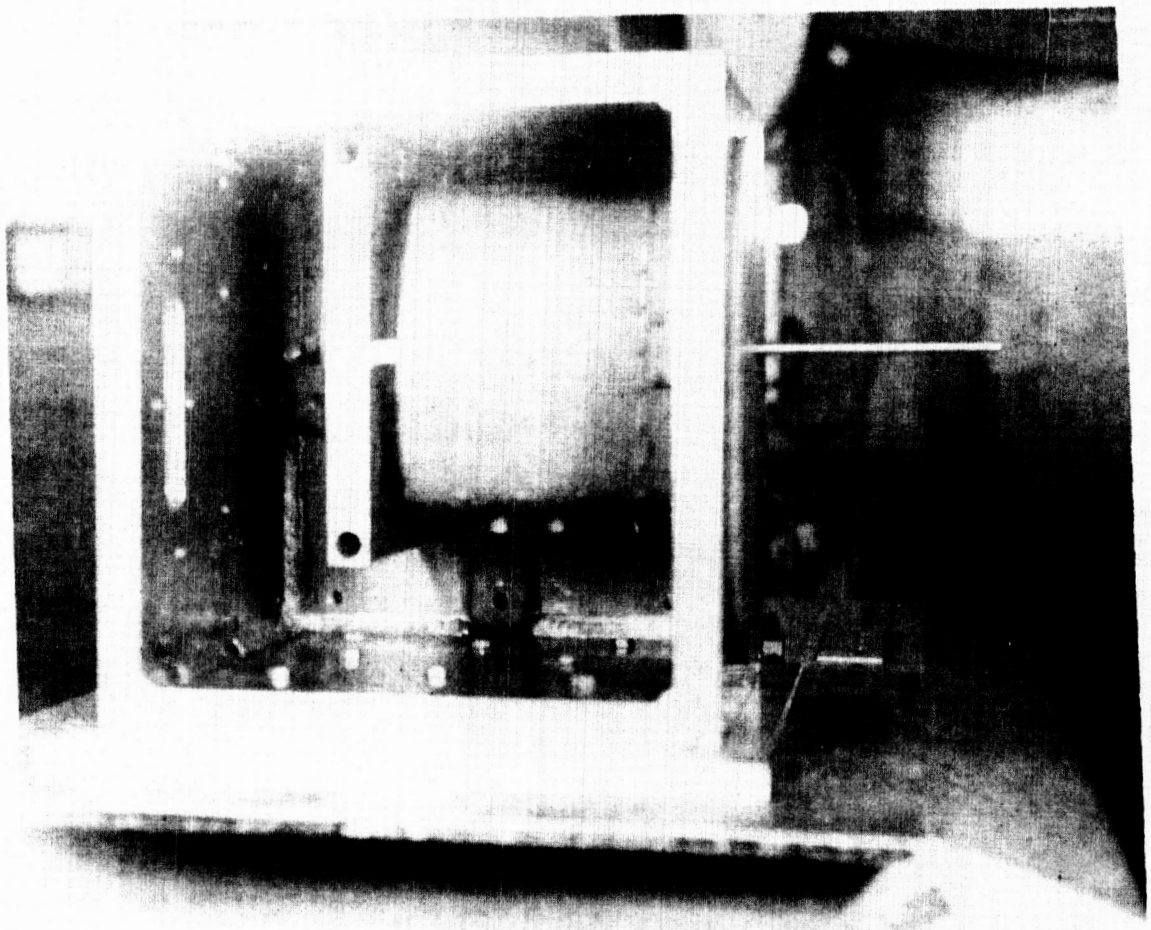


FIG. 3 - ACCELERATION TEST
LATERAL PLANE

ACCELERATION TEST

DATA SHEET
17409

DATE 3 OCT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass

NOTES:

Tester JW Adams

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45, CALIF.

TEST REPORT NO. 9

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 113

Test	Specification
Humidity	NAS8-2456 ITP 19600

Test Conducted By: Rototest Labs — Date 10/4/61 - 10/16/61

Subcontract Test Facility

C. Arbeau

Test Technician

Test Certified By: M. A. LaVere — Date 10/16/61

Test Engineer

USSC FORM 15

Unit Retractable Probe Date

Serial No. 113 Test No. 9 Run No. Proj. Engineer

1.0 Introduction:

1.1 As adequate equipment for conducting the Humidity test in accordance with the test requirements was not available at U. S. Science Corporation, the test was performed at:

Rototest Laboratories
2803 Los Flores Blvd.
Lynwood, California

1.2 The test was performed under the direction of a U. S. Science Corporation test engineer. A copy of the certified test report, Rototest Report No. 3276 (4) follows.

1.3 Required tests per ITP 19600 were conducted at U. S. Science Corporation facilities at the conclusion of the Humidity test. A test data sheet indicating the results of these tests follows the text of this report.

1.4 Testing to PTP 12792-15 was not accomplished. Elimination of this requirement was agreed upon and reference to page of this report is made.

Test Engineer Test Engineer

Service To:	Report No. 3276
U. S. SCIENCE CORPORATION 5221 WEST 102ND STREET LOS ANGELES 45, CALIF.	Purchase Order No. 1-108978 Contract No. -- Date NOVEMBER 1, 1961

CERTIFIED TEST REPORT

ENVIRONMENTAL TESTING

OF

TRANSDUCER,

ANGLE OF ATTACK WITH RETRACTABLE PROBE

rototest laboratories
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

COUNTY OF LOS ANGELES } SS
STATE OF CALIFORNIA }

VERN L. SANDBERG, LABORATORY SUPERVISOR, being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Vern L. Sandberg

SUBSCRIBED and sworn to before me this 1ST day of NOVEMBER, 1961

Ruby T Archambault

Notary Public in and for the County of Los Angeles, State of California.
My commission expires OCTOBER 2, 1962

Tests Conducted By:

HENRY BURMANN Henry Burm
EARL CHAPMAN Earl Chapman
ALBERT G. KLEINKNECHT Albert G. Kleinknecht
JAMES B. ROSE James B Rose by
WILLIAM J. KOLBERG William J. Kolberg by

Certified By: Andrew McKendry
Quality Control Engineer

Form QC-11
1-1-59

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

ADMINISTRATIVE DATA

DATE: NOVEMBER 1, 1961

NAME OF PART: TRANSDUCER, ANGLE OF ATTACK WITH RETRACTABLE PROBE

PURPOSE OF TEST: ENVIRONMENTAL TESTING

MANUFACTURER: U. S. SCIENCE CORPORATION

MANUFACTURER'S TYPE OR PART NO.: 10000070

DRAWING, SPECIFICATION OR EXHIBIT: U. S. SCIENCE CORPORATION CONTRACT No. NAS8-2456 SCHEDULE

QUANTITY OF ITEMS TESTED: ONE (1) SAMPLE

SECURITY CLASSIFICATION OF ITEMS: UNCLASSIFIED

DATE TEST COMPLETED: NOVEMBER 1, 1961

TEST CONDUCTED BY: ROTOTEST LABORATORIES, INC.

DISPOSITION OF SPECIMENS: THE SAMPLE WAS RETURNED TO U. S. SCIENCE CORPORATION.

SIGNATURES:

Vern L. Sandberg
VERN L. SANDBERG
LABORATORY SUPERVISOR

ABSTRACT:

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

TABLE OF CONTENTS

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2	DYNAMIC SHOCK	2.0
3.	RAIN	3.0
4.	HUMIDITY	4.0
5.	SALT SPRAY	5.0
6.	SAND AND DUST	6.0

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION

REFERENCE: U. S. SCIENCE CORPORATION PURCHASE ORDER NO. 1-108978; U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, ROTOTEST LETTER DATED SEPTEMBER 8, 1961

REQUIREMENT: TO PERFORM ENVIRONMENTAL TESTING IN ACCORDANCE WITH THE ABOVE SPECIFICATION AS FOLLOWS:

TEST NUMBER	TITLE OF TEST	SAMPLE	U. S. SCIENCE CONTRACT No. NAS8-2456 PARAGRAPH
1.	ACCELERATION	1	10
2.	DYNAMIC SHOCK	1	12
3.	RAIN	1	18
4.	HUMIDITY	1	14
5.	SALT SPRAY	1	15
6.	SAND AND DUST	1	16

GENERAL TEST INFORMATION

SAMPLE MOUNTING

THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS.

SAMPLE IDENTIFICATION

MFG. PART NO.	SERIAL NO.	ROTOTEST SAMPLE NO.
[illegible]	113	1

ENVIRONMENTAL MEASUREMENTS

ALL INSTRUMENTS AND AUXILIARY APPARATUS USED, WITH MANUFACTURER'S NAME, MODEL OR TYPE NUMBER AND SERIAL NUMBER ARE DESCRIBED IN THE INDIVIDUAL EQUIPMENT LISTS. ALL ELECTRICAL METERS HAVE BEEN CALIBRATED BY THE QUALITY ELECTRIC COMPANY OF LOS ANGELES AT APPROXIMATELY SIX MONTH INTERVALS. TEST INSTRUMENTS HAVE BEEN CALIBRATED BY QUALIFIED INDEPENDENT FACILITIES AT APPROXIMATELY 12 MONTH INTERVALS.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION - CONTINUED

GENERAL TEST INFORMATION: - CONTINUED

ADDITIONAL INFORMATION

ROTOTEST LETTER DATED SEPT. 8, 1961

"1. U. S. SCIENCE WILL SUPPLY A SUITABLE FIXTURE FOR THE ACCELERATION AND SHOCK TESTS.

2. THE UNIT WILL BE RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING."

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

4. HUMIDITY

SAMPLE 1

REFERENCE: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, PARAGRAPH 14

REQUIREMENT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456

"14. HUMIDITY: THE TEST SHALL BE PERFORMED IN ACCORDANCE WITH MIL-E-5272C, PARAGRAPH 4.4 PROCEDURE I EXCEPT THAT 10°F $^{+5}_{-0}$° SHALL BE MAINTAINED DURING THE LAST THREE HOURS OF EACH 24 HOUR CYCLE WITH NO HUMIDITY CONTROL."

PROCEDURE: THE SAMPLE WAS TESTED IN ACCORDANCE WITH THE PRECEDING REQUIREMENTS.

EQUIPMENT:

TO MEASURE	SYMBOL	UNIT	APPARATUS
AMBIENT TEMPERATURE	TA	°F	FIELDEN RECORDER, 0/230 x 2.0°F; ROTOTEST COLD CHAMBER, RTL F-7008; ALCOHOL THERMOMETER, -100/50 x 1°C
RELATIVE HUMIDITY	RH	PERCENT	LEATHERMAN HUMIDITY CHAMBER

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

4. HUMIDITY - CONTINUED

RESULTS:

DATE 1961	TIME	TA °F	RH PERCENT	CYCLE	SAMPLE	COMMENT
		SEE BELOW	95	10	1	SPECIFIED
10/4	5:00	96	95	1	1	SAMPLE IN CHAMBER; CHAMBER ON.
	7:00	160	95	-		CONDITIONS MET.
	1:00	160	95	-		CHAMBER OFF.
	5:00	98	95	-		ENDED CYCLE 1.
10/5	5:00	--	--	2		REPEATED CYCLE 1.
10/6	5:00	--	--	3		REPEATED CYCLE 1.
10/7	5:00	--	--	4		REPEATED CYCLE 1.
10/8	5:00	--	--	5		REPEATED CYCLE 1.
10/9	5:00	--	--	6		REPEATED CYCLE 1.
10/10	5:00	--	--	7		REPEATED CYCLE 1.
10/11	5:00	--	--	8		REPEATED CYCLE 1.
10/12	5:00	--	--	9		REPEATED CYCLE 1.
10/13	5:00	--	--	10		REPEATED CYCLE 1.
10/14	5:00	--	--	11		REPEATED CYCLE 1.
10/15	5:00	--	--	12		REPEATED CYCLE 1.
10/16	9:00 AM	--	--	-		ENDED EXPOSURE; SAMPLE SHIPPED TO U.S. SCIENCE CORPORATION.

VISUAL EXAMINATION

THE PAINT CRINKLED AND WAS DISCOLORED AT VARIOUS POINTS ON THE SAMPLE. RUST LIKE STAINS APPEARED ON THE TIP OF THE PROBE.

NOTE 1: SAMPLE PLACED IN CHAMBER AT 10°F FOR LAST THREE HOURS OF EACH CYCLE.

NOTE 2: SAMPLE ALLOWED TO REMAIN IN CHAMBER TWO EXTRA DAYS DUE TO THE INCONVENIENT DATE OF REMOVAL, PER INSTRUCTIONS OF U.S. SCIENCE CORPORATION PERSONNEL.

CONCLUSIONS: THE PAINT WAS CRINKLED AT VARIOUS POINTS ON THE SAMPLE. RUST LIKE STAINS WERE NOTED ON THE TIP OF THE PROBE. NO OTHER DAMAGE WAS NOTED. THE UNIT WAS RETURNED TO U.S. SCIENCE FOR PERFORMANCE TESTING.

HENRY BURMANN

10/20/61
IN

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 9 Run No. Proj. Engineer

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration, extend-retract cycling, and leak test. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1. For the remainder, statements below are significant.

3.2 It should be noted that the inability of the unit to extend and retract in the required time occurred only during the initial test. Subsequent testing immediately following the initial test, yielded "extend" and "retract" periods compatible with the test requirements. The following tabulation of an additional five operations illustrates this.

Function	Cycle No.					
	Initial	1	2	3	4	5
Extend Time (secs)	20	12	12	12	12	12
Retract Time (secs)	18	12	12	12	12	12

3.3 It is concluded that the "extend" and "retract" function periods were increased as a result of accumulated moisture on the lead screws and in the bearings. As suggested in the "Conclusions" section of Test Report No. 5, substitution of sealed lead screw bearings for shielded bearings and the use of a pop-out CA-plug at the retraction housing front face probe orifice, would materially reduce if not virtually eliminate moisture accumulation and reduced operational efficiency.

3.4 Failure of the "leak test" portion of the test is attributed to partial disassembly which was required to enable internal physical inspection. Seal integrity generally cannot be maintained unless production techniques are employed in reassembly. Since schedules would not permit this type of reassembly, the reassembly was performed by the test technician.

Test Engineer Test Engineer

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 9 Run No. Proj. Engineer

Additional Test Equipment

Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

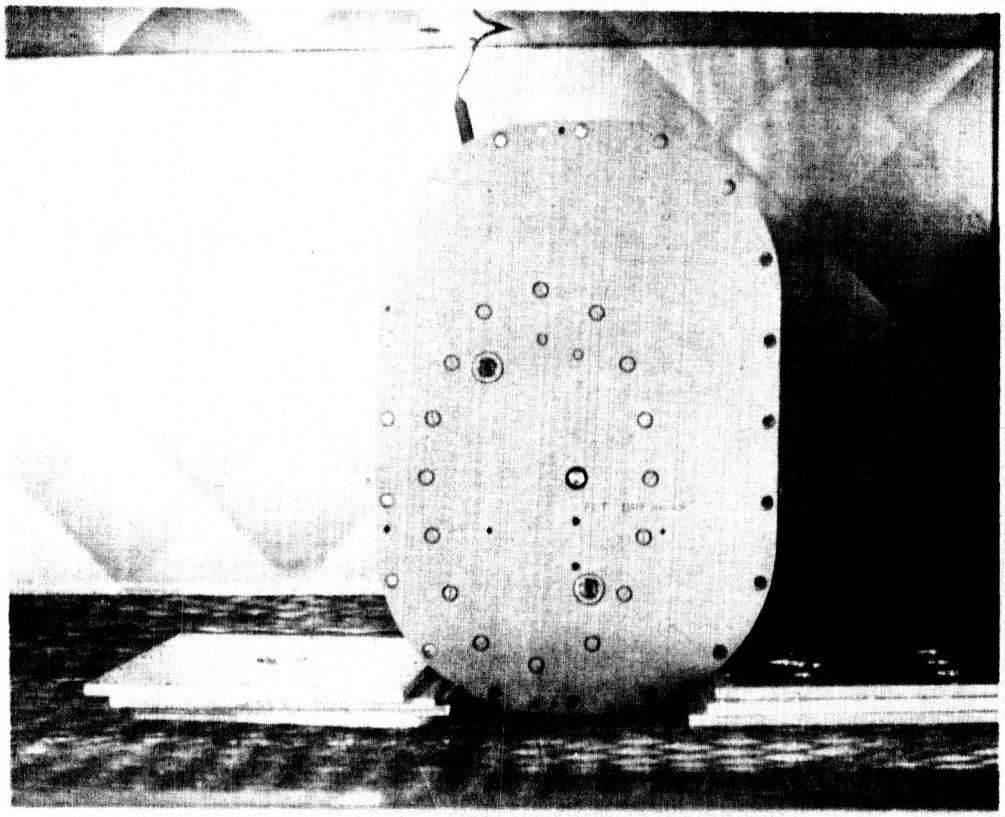

FIG. 1 [illegible]

HUMIDITY TEST

DATA SHEET
17409

DATE 16 OCT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Failed
Retract	(Maximum 15 seconds)		acc Failed
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	(Meter deflects to left of zero but on scale)	[illegible]	Failed
		[illegible]	Failed
		[illegible]	Failed
	(Meter deflects to right of zero but on scale)	[illegible]	Pass
		[illegible]	Pass
		[illegible]	Pass
		[illegible]	Pass
		[illegible]	Pass
		[illegible]	Pass
		[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	Failed
		[illegible]	Failed
		[illegible]	Failed

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST REPORT NO. 10

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
High Temperature Exposure	NAS8-2456

Test Conducted By: J. Thompson Date 10/5/61

Test Technician

Test Certified By: M. A. LaVere Date 10/5/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 10 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 7

1.1 "The unit shall be placed in the test chamber and mounted such that the retraction mechanism can be operated. The test chamber shall then be raised to a temperature of 93° ±2°C (200°F) for a period of 24 hours. A relative humidity of not more than 15% shall be maintained throughout the tests. At the end of this period perform a visual examination of the product."

2.0 Procedure:

2.1 The unit with probe extended was placed in the test chamber. Thermocouples were placed as follows:

Thermocouple No. 1: Chamber air temperature monitor; adjacent to probe.

Thermocouple No. 2: Unit temperature monitor; on retraction housing inspection cover adjacent to front face plate.

2.2 Figure 1 of this report illustrates the test set up.

2.3 At 1200 hours, 5 October 1961, the high temperature exposure test commenced. The chamber was raised to the required temperature. The chamber temperature and unit was monitored throughout the test. At 1200 hours, 6 October 1961, the required 24 hour exposure period was concluded. The unit was removed from the test chamber and a visual examination was performed.

3.0 Conclusion:

3.1 There was no evidence of physical deterioration (e.g. shifts in alignment, gasket swelling or finish damage) as a result of this exposure. It can be concluded that long term storage at elevated temperature will not physically affect the unit.

Test Engineer Test Engineer

USSC FF 4 20

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 10 Run No. Proj. Engineer

Test Equipment

Temperature Chamber, Bemco Model DF 100/650-1
Thermocouple Bridge, Leeds and Northrup Model 8658

Test Engineer Test Engineer

FIG. 7 HIGH TEMPERATURE TEST

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST REPORT NO. 11

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
High Temperature Operation	NAS8-2456 ITP 19600

Test Conducted By: J. Thompson — Date 10/6/61 – 10/9/61

C. Arbeau

Test Technicians

Test Certified By: M. A. LaVere — Date 10/9/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 11 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 8

1.1 "Reduce test chamber temperature from that shown in paragraph 7 to 71°C (160°F) and allow to stabilize for a period of four hours.

a. Test

Perform tests as shown in ITP 19600 and * PTP 12792-15.

*Refer to page 42 of this report.

2.0 Procedure:

2.1 At the conclusion of the High Temperature Exposure period, the temperature of the chamber was reduced to the required temperature. Thermocouples were used to indicate unit and chamber temperature. They were placed as follows:

Thermocouple No. 1 - Chamber air temperature monitor; adjacent to probe.

Thermocouple No. 2 - Unit temperature monitor; on retraction housing inspection cover adjacent to front face plate.

2.2 At 1230 hours, 6 October 1961, the unit temperature stabilized at 71°C (160°F). This temperature was maintained for a period of 4 hours. At the conclusion of this period, the probe actuating mechanism was energized. Times required for extension and retraction are tabulated below.

Operation	1	2	3	4	5
Extend Time (secs)	10	10	10	10	10
Retract Time (secs)	10	10	10	10	10

2.3 After the operational period, the chamber and unit were returned to room ambient conditions. The unit was then subjected to the requirements of ITP 19600.

2.4 A modification of the test requirement was necessary during the 71°C test cycle. Specifically, those tests which utilized the wind tunnel were waived since it was impossible to install the wind tunnel in the test chamber.

Test Engineer Test Engineer

Unit Retractable Probe Date

Serial No. 107 Test No. 11 Run No. Proj. Engineer

With the concurrence of the resident NASA representative, it was agreed to perform the same operating test specified for "Low Temperature Operation", which are:

1. The extend switch shall be engaged and the time to extend tabulated.

2. The retract switch shall be engaged and the time taken to retract tabulated.

3. Repeat the tests of 1 and 2 five times.

4. Return unit to room ambient conditions and perform tests specified in ITP 19600 and PTP 12792-15.

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements during and after high temperature exposure except Air Jet Calibration and leak test. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1. Statements concerning leak test are contained in the "Conclusions" section of Test Report No. 4. A data sheet indicating the results of the tests performed follows the text of this report.

3.2 It can be concluded that the probe actuating mechanism performs within specification limits at elevated temperatures.

Test Engineer Test Engineer

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 11 Run No. Proj. Engineer

Test Equipment

Temperature Chamber, Bemco Model DF100/650-1
Thermocouple Bridge, Leeds and Northrup Model 8658
Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

HIGH TEMPERATURE EXPOSURE & OPERATION TEST DATA SHEET 17409

DATE 9 OCT, 61

S/N 107

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration +	(Meter deflects to left of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
-	(Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Failed

NOTES:

Tester [signature]

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST REPORT NO. 12

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transmitter, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
Heater Element Endurance	NAS8-2456 ITP 19600

Test Conducted By: J. Thompson — Date 10/10/61
C. Arbeau — 10/16/61
Test Technicians

Test Certified By: M. A. LaVere — Date 10/16/61
Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 12 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 19

1.1 a. This test shall be performed with probe extended in a wind tunnel at approximately 110 knots.

b. The power shall be applied to the heater and allowed to operate continuously for a period of 50 hours.

c. At each 10 hour period, the current, voltage and temperature of the probe shall be monitored and recorded.

2.0 Procedure:

2.1 To simulate the wind tunnel requirement, a fixture was fabricated which consisted of a pair of parallel tubes, an air supply hose fitting and a bracket which enabled mounting the fixture to the retraction housing front face plate. The parallel tubes contained several pairs of holes, which when properly aligned along the probe longitudinal axis, allowed a continuous supply of air to be directed to the probe. In addition, the output from a squirrel cage type blower with an approximate capacity of 80 CFM was directed at the probe from an approximate distance of one foot. The combined effect of these two air sources produced a condition which satisfactorily simulated the wind tunnel environment.

2.2 Pretest experiments indicated that probe discoloration resulting from heater operation in still air does not occur until the surface temperature of the probe is in excess of 500°F. The purpose of these pretest experiments was to determine an upper temperature limit which assures adequate safety of the equipment. A temperature was then selected which would not discolor the probe, specifically 200°F to 350°F.

2.3 Figure 1 of this report is a schematic of a fixture allowing heater operation which produces a nominal probe surface temperature range of approximately 200°F to 350°F. Its operation is as follows: With 28 VDC power applied to the input terminals, relay K1 is in a de-energized position and routes power through its normally closed contacts to the probe heater, and thermal switch No. 2. A jumper is momentarily applied across thermal switch No. 2 to allow for energization of thermal relay K2. Thermal switch No. 2 is fastened to the probe and is normally open if the probe surface temperature is below 200°F. This operation is equivalent to faulty heater operation. The running time meter depends upon the operation of K2 for power, and thermal switch No. 2 controls the power to relay K2. If heater power fails, thermal switch

Test Engineer Test Engineer

Unit Retractable Probe Date

Serial No. 107 Test No. 12 Run No. Proj. Engineer

No. 2 opens which opens thermal relay K2, removing power from the clock. Thermal switch No. 1 is also fastened to the probe and is normally open. If the air supply fails and the surface temperature of the probe increases above 350°F, thermal switch No. 1 would close allowing ground potential to be applied to relay K1. The normally open contacts of K1 are wired to the negative side of the 28 volt supply. Closure of relay K1 results in a blown fuse which removes all power and halts the test.

2.4 Pretest checkout indicated that the heater would not take power. Internal inspection of the transducer showed the heater negative supply lead to be severed. It was reasoned that the following sequence probably caused the malfunction:

a. An extremely tight string tie on the wire bundle containing the heater lead caused severence of one of these leads. (Observed in the examination.)

b. Added flexibility of the severed end, caused breakage at the header pin as a result of the additional vibration applied to this unit. (Recall that the entire vibration test was performed twice.)

c. Heater current was too great for the remaining lead and burn out resulted. This was evidenced by charred wire ends.

2.5 Rewiring of the heater circuit per the applicable drawing was not possible without complete disassembly and a considerable schedule slippage. In the interest of schedule maintenance, connection of the heater circuit with a jumper wire placed external to the transducer case was performed. As a result of this mode of wiring, the transducer cover was discarded for the remainder of the required tests.

2.6 At 1415 hours on 11 October 1961, heater element endurance test was begun. As a convenience measure, and since personnel are not available during evening hours, required readings were taken each morning at 0840 hours and each evening at 1700 hours in lieu of each 10 hours as required.

Test Engineer Test Engineer

USSC FF M 20

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 12 Run No. Proj. Engineer

Time of Reading	Date	Voltage DC	Current DC	TC No. 1 * Fahrenheit	TC No. 2 ** Fahrenheit	Elapsed Time Hours
1415	10/11/61	28.0	5.0	260°	170°	0.0
1700	10/11/61	28.0	4.9	260°	180°	2.7
0840	10/12/61	28.0	4.9	260°	180°	18.4
1700	10/12/61	28.0	4.9	260°	175°	26.7
0840	10/13/61	28.0	4.9	240°	160°	42.2
1615	10/13/61	28.0	4.9	260°	175°	50.0

* Thermocouple No. 1 mounted 1/2" from probe tip.

** Thermocouple No. 2 mounted 1" from probe base.

2.7 Figure 2 of this test report depicts the test set up.

2.8 At the conclusion of the prescribed test period, the unit was subjected to the requirements of ITP 19600 and a data sheet indicating the results of these tests follows the text of this report.

3.0 Conclusions:

3.1 It was concluded that lead breakage occurred because of unusual stress conditions, namely excessive tension on a string tie and double vibration exposure. The tight string tie is an isolated occurrence which was not observed on other similar units currently in production.

3.2 The unit was capable of meeting the test requirements of ITP 19600 except for Air Jet Calibration and Leak Test. Statements concerning Air Jet Calibration are contained in the "Conclusion" section of Test Report No. 1. Statements concerning Leak Test failure are contained in the "Conclusion" section of Test Report No. 4.

Test Engineer Test Engineer

USSC FORM 20

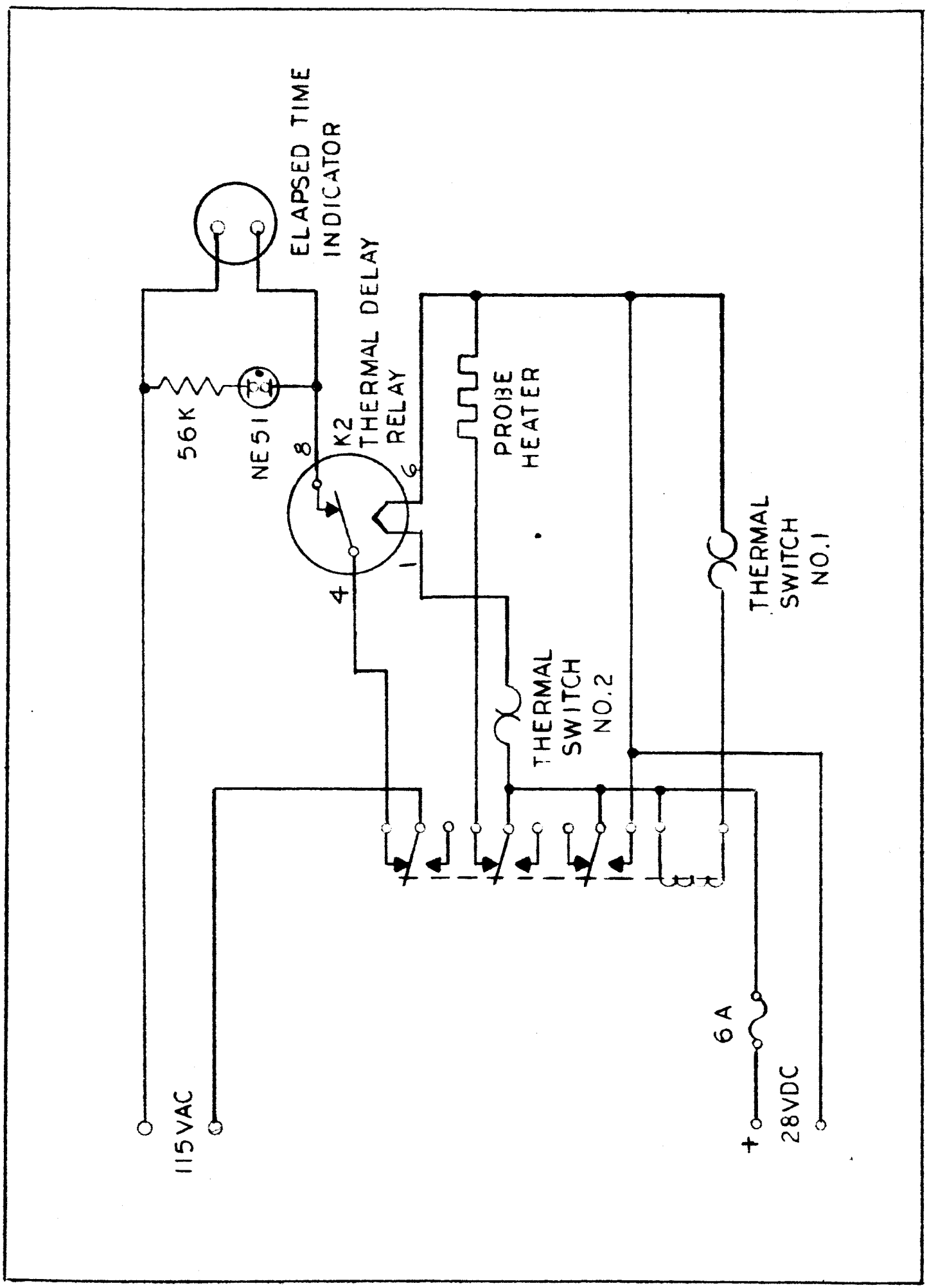
ELAPSED TIME INDICATOR
56K
NE51
K2 THERMAL DELAY RELAY
8
6
4
1
PROBE HEATER
THERMAL SWITCH NO.2
THERMAL SWITCH NO.1
6A
115VAC
28VDC
+

FIGURE 1

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 12 Run No. Proj. Engineer

Test Equipment

Power Supply, 28 VDC, Perkin MR 532-15A
Voltmeter, part of above supply
Ammeter, part of above supply
Temperature Bridge, Simpson 388-3L
Running Time Meter, J. B. T. 31-EX
Blower, Axial, Redmond BL-80
Monitoring Fixture, USSC Special Design
Air Flow Fixture, USSC Special Design
Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

FIG. HEATER ENDURANCE TEST

HEATER ENDURANCE TEST

DATA SHEET
17409

DATE 16 OCT. 61

S/N 107

TEST	INSTRUCTIONS	STAMP
1. Megger	(Green portion of insulation resistance scale)	acc Pass
2. Zero	(Meter can be zeroed)	acc Pass
3. Linearity	(Green portion of linearity scale)	+14° acc Pass + 7° acc Pass - 7° acc Pass -14° acc Pass
4. Extend	(Maximum 15 seconds)	acc Pass
Retract	(Maximum 15 seconds)	acc Pass
5. Phase Lag	(15° maximum)	acc Pass
6. Noise	(Test ok lamp remains on)	acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Failed 110 lbs. acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs. acc Pass 100 lbs. acc Failed 110 lbs. acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)	acc Pass
	("on" when extended-"off" when retracted)	acc Pass
		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)	acc Failed

NOTES:

Tester C W Arbeau

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45, CALIF.

TEST REPORT NO. 13

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 113

Test	Specification
Salt Spray	NAS8-2456 ITP 19600

Test Conducted By: Rototest Labs — Date 10/18/61 - 10/23/61

Subcontract Test Facility

C. Arbeau

Test Technician

Test Certified By: M. A. LaVere — Date 10/23/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 13 Run No. Proj. Engineer

1.0 Introduction:

1.1 As adequate equipment for conducting the Salt Spray test in accordance with the test requirements was not available at U. S. Science Corp., the test was performed at:

Rototest Laboratories
2303 Los Flores Blvd.
Lynwood, California

1.2 The test was performed under the direction of a U. S. Science Corp. test engineer. A copy of the certified test report, Rototest Report No. 3276 (5) follows.

1.3 Required tests per ITP 19600 were conducted at U. S. Science Corp. facilities at the conclusion of the Humidity test. A test data sheet indicating the results of these tests follows the text of this report.

1.4 Testing to PTP 12792-15 was not accomplished. Elimination of this requirement was agreed upon and reference to page 42 of this report is made.

Test Engineer Test Engineer

Service To:	Report No. 3276
U. S. SCIENCE CORPORATION 5221 WEST 102ND STREET LOS ANGELES 45, CALIF.	Purchase Order No. 1-108978 Contract No. -- Date NOVEMBER 1, 1961

CERTIFIED TEST REPORT

ENVIRONMENTAL TESTING

OF

TRANSDUCER,

ANGLE OF ATTACK WITH RETRACTABLE PROBE

rototest laboratories
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

COUNTY OF LOS ANGELES) SS
STATE OF CALIFORNIA)

VERN L. SANDBERG, LABORATORY SUPERVISOR being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Vern L. Sandberg

SUBSCRIBED and sworn to before me this 1st day of NOVEMBER, 1961

Ruby T Archambault

Notary Public in and for the County of Los Angeles, State of California.
My commission expires OCTOBER 2, 1962

Tests Conducted By:

HENRY BURMANN Henry Burm

EARL CHAPMAN Earl Chapman

ALBERT G. KLEINKNECHT Albert G. Kleinknecht

JAMES B. ROSE James B Rose by

WILLIAM J. KOLBERG William J Kolberg by

Certified By: Andrew McKendry
Quality Control Engineer

Form QC-11
1-1-59

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

ADMINISTRATIVE DATA

DATE: NOVEMBER 1, 1961

NAME OF PART: TRANSDUCER, ANGLE OF ATTACK WITH RETRACTABLE PROBE

PURPOSE OF TEST: ENVIRONMENTAL TESTING

MANUFACTURER: U. S. SCIENCE CORPORATION

MANUFACTURER'S TYPE OR PART NO.: 10000070

DRAWING, SPECIFICATION OR EXHIBIT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456 SCHEDULE

QUANTITY OF ITEMS TESTED: ONE (1) SAMPLE

SECURITY CLASSIFICATION OF ITEMS: UNCLASSIFIED

DATE TEST COMPLETED: NOVEMBER 1, 1961

TEST CONDUCTED BY: ROTOTEST LABORATORIES, INC.

DISPOSITION OF SPECIMENS: THE SAMPLE WAS RETURNED TO U. S. SCIENCE CORPORATION.

SIGNATURES:

Vern L. Sandberg
VERN L. SANDBERG
LABORATORY SUPERVISOR

ABSTRACT:

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

TABLE OF CONTENTS

TEST NUMBER	TITLE OF TEST	PAGE
	INTRODUCTION	0.2
1.	ACCELERATION	1.0
2.	DYNAMIC SHOCK	2.0
3.	RAIN	3.0
4.	HUMIDITY	4.0
5.	SALT SPRAY	5.0
6.	SAND AND DUST	6.0

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION

REFERENCE: U. S. SCIENCE CORPORATION PURCHASE ORDER NO. 1-108978; U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-246, ROTOTEST LETTER DATED SEPTEMBER 8, 1961

REQUIREMENT: TO PERFORM ENVIRONMENTAL TESTING IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AS FOLLOWS:

TEST NUMBER	TITLE OF TEST	SAMPLE	U. S. SCIENCE CONTRACT NO. NAS8-2456 PARAGRAPH
1.	ACCELERATION	1	10
2.	DYNAMIC SHOCK	1	12
3.	RAIN	1	18
4.	HUMIDITY	1	14
5.	SALT SPRAY	1	15
6.	SAND AND DUST	1	16

GENERAL TEST INFORMATION.

SAMPLE MOUNTING

THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS.

SAMPLE IDENTIFICATION

TEST PART NO.	SERIAL NO.	ROTOTEST SAMPLE NO.
[illegible]	113	1

TEST EQUIPMENT MEASUREMENTS

ALL INSTRUMENTS AND AUXILIARY APPARATUS USED, WITH MANUFACTURER'S NAME, MODEL OR TYPE NUMBER AND SERIAL NUMBER ARE DESCRIBED IN THE INDIVIDUAL EQUIPMENT LISTS. ALL ELECTRICAL METERS HAVE BEEN CALIBRATED BY THE QUALITY ELECTRIC COMPANY OF LOS ANGELES AT APPROXIMATELY SIX MONTH INTERVALS. TEST INSTRUMENTS HAVE BEEN CALIBRATED BY QUALIFIED INDEPENDENT FACILITIES AT APPROXIMATELY 12 MONTH INTERVALS.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION - CONTINUED

GENERAL TEST INFORMATION: - CONTINUED

ADDITIONAL INFORMATION

ROTOTEST LETTER DATED SEPT. 8, 1961

"1. U. S. SCIENCE WILL SUPPLY A SUITABLE FIXTURE FOR THE ACCELERATION AND SHOCK TESTS.

2. THE UNIT WILL BE RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING."

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

5. SALT SPRAY

SAMPLE 1

REFERENCE: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, PARAGRAPH 15

REQUIREMENT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456

"15. SALT SPRAY: WITH THE UNIT IN ITS RETRACTED POSITION, PERFORM SALT SPRAY TEST AS SPECIFIED BY MIL-E-5272C, PARAGRAPH 4.6, PROCEDURE I AND FEDERAL TEST METHOD STANDARD NO. 151, METHOD 811."

PROCEDURE: THE TEST SAMPLE WAS CLEANED AND THEN SUSPENDED IN THE SALT SPRAY CHAMBER BY MEANS OF WAX STRING. THE SAMPLE WAS POSITIONED SO THAT IT DID NOT CONTACT OTHER OBJECTS OR COME IN CONTACT WITH FALLING CONDENSATE FROM OTHER OBJECTS.

AT THE END OF THE TEST, THE SAMPLE WAS IMMEDIATELY EXAMINED TO DETERMINE COMPLIANCE WITH THE PRECEDING TEST REQUIREMENTS.

EQUIPMENT:

TO MEASURE	SYMBOL	UNIT	APPARATUS
AMBIENT TEMPERATURE	TA	°F	ALCOHOL THERMOMETER, 80/140 x 1°F
VOLUME OF COLLECTED SOLUTION	VCS	ML/HR.	GRADUATE
SOLUTION TEMPERATURE	TS	°F	MERCURY THERMOMETER
PH OF COLLECTED SOLUTION	PH	--	COLORIMETRIC METHOD; LAMOTTE CHEMICAL PRODUCTS COMPARATOR.
SPECIFIC GRAVITY COLLECTED SOLUTION	SP GR	--	UNIVERSAL HYDROMETER
SALT SOLUTION	--	--	20% SODIUM CHLORIDE DISSOLVED IN DISTILLED WATER (BY WEIGHT).

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

5. SALT SPRAY - CONTINUED

RESULTS:

DATE 1961	TIME	TA °F	VCS ML/HR.	COLLECTED SOLUTION Ts °F	pH	SP GR	SAMPLE	COMMENT
						1.126		
		92-97	0.5-3*	92-97	6.5-7.2	1.157	1	SPECIFIED
10/ 8	1:30	95	--	--	--	--	1	SAMPLE CLEANED. STARTED EXPOSURE.
10/19	1:30		1.39	95	7.0	1.134		ENDED 24 HOURS.
10/20	3:30		1.27	95	7.0	1.134		ENDED 50 HOURS; SAMPLE REMOVED AND EXAMINED.

* CONDENSATE COLLECTED OVER 80 SQ.CM. OF HORIZONTAL COLLECTING AREA, BASED ON AN AVERAGE RUN OF 24 HOURS.

VISUAL EXAMINATION

THE FOLLOWING CONDITIONS WERE OBSERVED ON THE SAMPLE AFTER SALT SPRAY EXPOSURE.

1. SLIGHT RUST ON LEAD SCREW ON FRONT BEARING.
2. SLIGHT METAL DETERIORATION ON BACK AND FRONT PANEL RETAINING SCREW HOLES, ALSO ON NOZZLE BLOCK AND SIDE PLATES.
3.* BLISTERING AND PEELING OF PAINT NOTED ON ENTIRE EXTERNAL SURFACE OF SAMPLE.
4.* PAINT BLISTERING NOTED ON INSIDE SURFACE OF SAMPLE.

* BLISTERING AND PEELING BEGAN AS A RESULT OF THE HUMIDITY TEST.

CONCLUSIONS: PERFORMANCE TESTS WERE CONDUCTED BY U. S. SCIENCE THEREFORE NO CONCLUSIONS WERE DRAWN BY ROTOTEST LABORATORIES.

ALBERT G. KLEINKNECHT

10/30/61
DH

Unit Retractable Probe Date

Serial No. 113 Test No. 13 Run No. Proj. Engineer

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration, Extend-Retract cycling, and Leak Test. Statements concerning Air Jet Calibration are contained in the "Conclusions" section of Test Report No. 1. Statements on the remainder are contained below.

3.2 The inability of the unit to meet the Extend and Retract cycling period requirements occurred only during the initial excitation. Subsequent operations yielded extend and retract periods compatible with the test requirements. The following tabulation of an additionalfive operations is illustrated.

Function	Initial	1	2	3	4	5
Extend Time (secs)	20	12	12	12	12	12
Retract Time (secs)	17	12	12	12	12	12

3.3 As similarly stated at the conclusion of the Humidity test, the "extend" and "retract" function periods were increased as a result of accumulated moisture or salt residue in the lead screws and in the bearings. As suggested in the "Conclusions" section of Test Report No. 5, the use of sealed lead screw bearings in lieu of shielded bearings and the use of a pop-out CA-plug at the retraction housing front face plate probe orifice would materially reduce if not virtually eliminate moisture and residue accumulation and reduced operational efficiency.

3.4 Failure of the "leak test" portion of the test is directly attributed to partial disassembly which was required to enable internal physical inspection. Seal integrity is not usually maintained unless production techniques are employed in reassembly. Since schedules did not permit this type of reassembly, the reassembly was performed by the test technician.

3.5 Areas of corrosion were apparent, particularly where painted surfaces blistered or peeled during Humidity testing. These corroded areas were limited to the external portions of the unit. There were no visible areas of contamination within the retraction housing except for salt deposits directly behind

Test Engineer Test Engineer

Unit Retractable Probe Date

Serial No. 113 Test No. 13 Run No. Proj. Engineer

the front face plate probe orifice, where leakage from the external surfaces had occurred.

3.6 The following recommendations are presented which will greatly increase corrosion resistance of the housing.

Finish for magnesium surfaces:

1. Deoxidize

2. Apply HAE per MIL-C-13335 and MIL-M-45205, .002" thick.

3. Prime, chemical caticoat primer, Sherwin Williams Co., B-69D30 with V66V15 catalyst and R6K22 thinner, or equivalent, 1.5 mils thick, baked 45 minutes at 160° to 180°F.

4. Aero caticoat F55A, Sherwin Williams Co., or equivalent, two coats with catalyst V66KP10 and V66KP11 reducer, 1.5 mils thick, baked for 2 hours at 160° to 180°F.

   This process for magnesium alloys meets the requirements of MIL-M-3171 and yields approximately 175 hours of protection against a salt spray environment, as described in MIL-E-5272C.

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 13 Run No. Proj. Engineer

Additional Test Equipment

Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

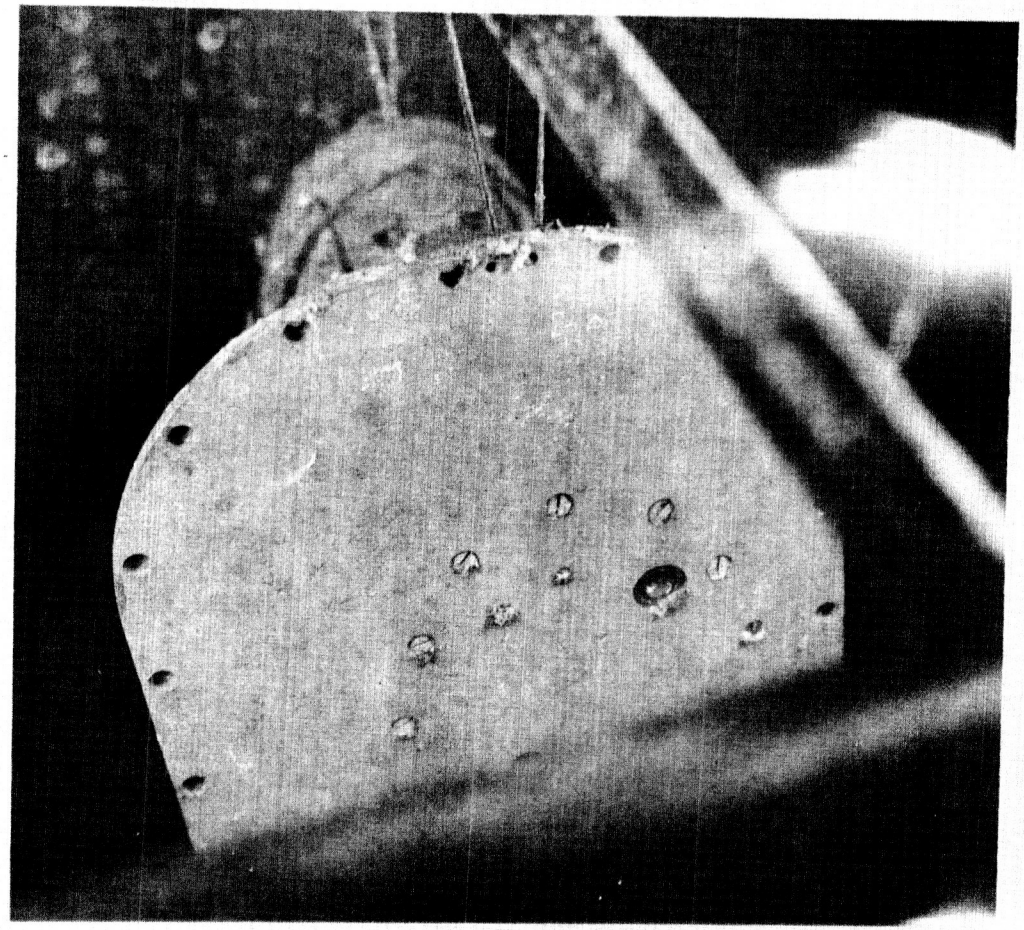

FIG. 1 SALT SPRAY TEST

50 HOUR SALT SPRAY TEST

DATA SHEET
17409

DATE 23 OCT. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Failed
Retract	(Maximum 15 seconds)		acc Failed
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Failed

NOTES:

Tester C W Arbeau

U.S SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST REPORT NO. 14

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 113

Test	Specification
Sand and Dust	NAS8-2456 ITP 19600

Test Conducted By: Rototest Labs — Date 10/30/61 – 11/3/61

Subcontract Test Facility

C. Arbeau
Test Technician

Test Certified By: M. A. LaVere — Date 11/3/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 14 Run No. Proj. Engineer

1.0 Introduction:

1.1 As adequate equipment for conducting the Sand and Dust test in accordance with the test requirements was not available at U. S. Science Corp., the test was performed at:

Rototest Laboratories
2803 Los Flores Blvd.
Lynwood, California

1.2 The test was performed under the direction of a U. S. Science Corp. test engineer. A copy of the certified test report, Rototest Report No. 3276 (6) follows.

1.3 Required tests per ITP 19600 were conducted at U. S. Science Corp. facilities at the conclusion of the Sand and Dust test. A test data sheet indicating the results of these tests follows the text of this report.

1.4 Testing to PTP 12792-15 was not accomplished. Elimination of this requirement was agreed upon and reference to page 42 of this report is made.

Test Engineer Test Engineer

Service To:	Report No. 3276
U. S. SCIENCE CORPORATION 5221 WEST 102ND STREET LOS ANGELES 45, CALIF.	Purchase Order No. 1-108978 Contract No. -- Date NOVEMBER 1, 1961

CERTIFIED TEST REPORT

ENVIRONMENTAL TESTING

OF

TRANSDUCER,

ANGLE OF ATTACK WITH RETRACTABLE PROBE

rototest laboratories
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

COUNTY OF LOS ANGELES } SS
STATE OF CALIFORNIA }

VERN L. SANDBERG, LABORATORY SUPERVISOR,

being duly sworn, deposes and says: That the information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Vern L. Sandberg

SUBSCRIBED and sworn to before me this 1ST day of NOVEMBER, 1961

Ruby T Archambault

Notary Public in and for the County of Los Angeles, State of California.
My commission expires OCTOBER 2, 1962

Tests Conducted By:

HENRY BURMANN Henry Burm...

EARL CHAPMAN Earl Chapman

ALBERT G. KLEINKNECHT Albert G. Kleinknecht

JAMES B. ROSE James B Rose by ...

WILLIAM J. KOLBERG William J. Kolberg by ...

Certified By: Andrew McKendry
Quality Control Engineer

Form QC-11
1/1/59

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

ADMINISTRATIVE DATA

DATE: NOVEMBER 1, 1961

NAME OF PART: TRANSDUCER, ANGLE OF ATTACK WITH RETRACTABLE PROBE

PURPOSE OF TEST: ENVIRONMENTAL TESTING

MANUFACTURER: U. S. SCIENCE CORPORATION

MANUFACTURER'S TYPE OR PART NO.: 10000070

DRAWING, SPECIFICATION OR EXHIBIT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456 SCHEDULE

QUANTITY OF ITEMS TESTED: ONE (1) SAMPLE

SECURITY CLASSIFICATION OF ITEMS: UNCLASSIFIED

DATE TEST COMPLETED: NOVEMBER 1, 1961

TEST CONDUCTED BY: ROTOTEST LABORATORIES, INC.

DISPOSITION OF SPECIMENS: THE SAMPLE WAS RETURNED TO U. S. SCIENCE CORPORATION.

SIGNATURES:

Vern L. Sandberg
VERN L. SANDBERG
LABORATORY SUPERVISOR

ABSTRACT:

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

TABLE OF CONTENTS

Test Number	Title of Test	Page
	INTRODUCTION	0.2
1.	ACCELERATION	1.0
2.	DYNAMIC SHOCK	2.0
3.	RAIN	3.0
4.	HUMIDITY	4.0
5.	SALT SPRAY	5.0
6.	SAND AND DUST	6.0

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION

REFERENCE: U. S. SCIENCE CORPORATION PURCHASE ORDER NO. 1-108978; U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2486; ROTOTEST LETTER DATED SEPTEMBER 8, 1961

REQUIREMENT: TO PERFORM ENVIRONMENTAL TESTING IN ACCORDANCE WITH THE ABOVE SPECIFICATIONS AS FOLLOWS:

TEST NUMBER	TITLE OF TEST	SAMPLE	U. S. SCIENCE CONTRACT No. NAS8-2456 PARAGRAPH
	ACCELERATION	1	10
2.	DYNAMIC SHOCK	1	12
3.	RAIN	1	18
4.	HUMIDITY	1	14
5.	SALT SPRAY	1	15
6.	SAND AND DUST	1	16

GENERAL TEST INFORMATION:

SAMPLE MOUNTING

THE SAMPLE WAS MOUNTED BY ITS NORMAL MOUNTING MEANS.

SAMPLE IDENTIFICATION

MFG. PART NO.	SERIAL NO.	ROTOTEST SAMPLE NO.
[illegible]C7C	113	1

ELECTRICAL MEASUREMENTS

ALL INSTRUMENTS AND AUXILIARY APPARATUS USED, WITH MANUFACTURER'S NAME, MODEL OR TYPE NUMBER AND SERIAL NUMBER ARE DESCRIBED IN THE INDIVIDUAL EQUIPMENT LISTS. ALL ELECTRICAL METERS HAVE BEEN CALIBRATED BY THE QUALITY ELECTRIC COMPANY OF LOS ANGELES AT APPROXIMATELY SIX MONTH INTERVALS. TEST INSTRUMENTS HAVE BEEN CALIBRATED BY QUALIFIED INDEPENDENT FACILITIES AT APPROXIMATELY 12 MONTH INTERVALS.

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

INTRODUCTION - CONTINUED

GENERAL TEST INFORMATION: - CONTINUED

ADDITIONAL INFORMATION

ROTOTEST LETTER DATED SEPT. 8, 1961

"1. U. S. SCIENCE WILL SUPPLY A SUITABLE FIXTURE FOR THE ACCELERATION AND SHOCK TESTS.

2. THE UNIT WILL BE RETURNED TO U. S. SCIENCE FOR PERFORMANCE TESTING."

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

6. SAND AND DUST

SAMPLE 1

REFERENCE: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456, PARAGRAPH 16

REQUIREMENT: U. S. SCIENCE CORPORATION CONTRACT NO. NAS8-2456

"16. SAND AND DUST: A. THE UNIT SHALL BE MOUNTED IN A SIMILAR MANNER TO ITS NORMAL INSTALLATION AND WITH THE PROBE IN THE RETRACTED POSITION, THE TEST SHALL BE PERFORMED AS PER MIL-E-5272C, PARAGRAPH 4.11.1, PROCEDURE I.

B. THE UNIT SHALL BE FUNCTIONALLY TESTED AS PER USSC ITP 19600 AND PTP 12792-15 UPON COMPLETION OF THESE TESTS."

PROCEDURE: THIS TEST WAS PERFORMED IN ACCORDANCE WITH MIL-E-5272C. THE UNIT WAS PLACED WITH THE FLIGHT DIRECTION ARROW "UP" WITH THE PROBE RETRACTED.

EQUIPMENT:

TO MEASURE	SYMBOL	UNIT	APPARATUS
AMBIENT TEMPERATURE	TA	°C	MERCURY THERMOMETER, -10/110 x 1°C
SAND AND DUST CHAMBER	--	--	ROTOTEST SAND AND DUST CHAMBER NO. 1
RELATIVE HUMIDITY	RH	PERCENT	SERDEX, MODEL 201, 0/100 x 1%
SAND AND DUST DENSITY	D	GM./CU.FT.	OHAUS SCALE, 0/5 LB. x 0.01 OZ.
SAND AND DUST VELOCITY	V	FT./MIN.	ALNOR VELOMETER, TYPE 3002, S.N. 14678

rototest laboratories, inc.
2803 Los Flores Boulevard
Lynwood, California
NEvada 6-9238

6. SAND AND DUST - CONTINUED

RESULTS:

DATE 1961	TIME	TA °C	RH PERCENT	D GM./CU.FT.	V FT./MIN.	SAMPLE	COMMENT
		25±10 71±2	<30	0.1 TO 0.5	100 TO 500	1	SPECIFIED
10/[illegible]	11:00	34	25	0.30	300	1	SAMPLE IN CHAMBER; BEGAN TEST, PART 1.
	5:00	35	--	0.30	300		ENDED PART 1.
	5:10	--	--	--	--		RAISED TEMPERATURE.
	5:30	71	--	0.30	300		BEGAN PART 2.
	11:30	71	--	0.30	300		ENDED PART 2; ALLOWED TO COOL.
11/1	8:10	24	--	--	--		WIPED OFF ACCUMULATED DUST.

VISUAL EXAMINATION

NO EVIDENCE OF EXTERNAL PHYSICAL DAMAGE WAS OBSERVED.

CONCLUSIONS: SAMPLE 1 WAS NOT VISIBLY DAMAGED DURING THE SAND AND DUST EXPOSURE. NO CONCLUSIONS WERE DRAWN BY ROTOTEST LABORATORIES SINCE THE FUNCTIONAL TESTS WERE TO BE PERFORMED BY U. S. SCIENCE CORPORATION.

ALBERT G. KLEINKNECHT
EARL CHAPMAN

11/1/61
DH

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 14 Run No. Proj. Engineer

3.0 Conclusions:

3.1 The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration, and Leak Test. Statements concerning air jet calibration are contained in the "Conclusions" section of Test Report No. 1. Leak Test statements are noted below.

3.2 Failure to maintain seal integrity resulted from frequent disassembly required to enable internal inspection after Humidity, Rain and Salt Spray tests. Additional statements concerning leakage are contained in the "Conclusions" sections of the test reports for those tests.

3.3 It can be concluded that the unit is capable of proper operation after exposure to severe sand and dust conditions.

Test Engineer Test Engineer

Unit Retractable Probe Date

Serial No. 113 Test No. 14 Run No. Proj. Engineer

Additional Test Equipment

Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

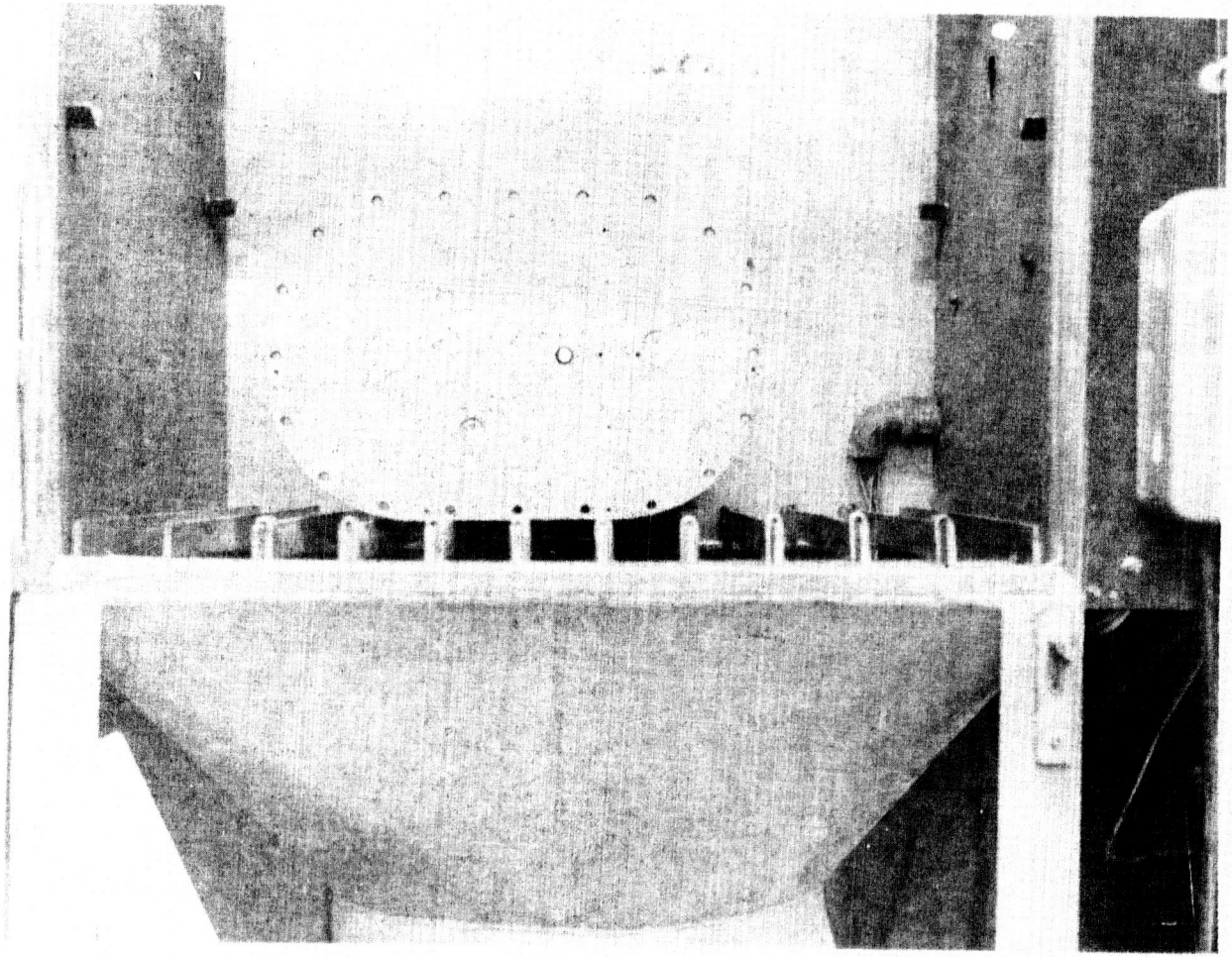

FIG. 1 SAND AND DUST TEST

SAND & DUST TEST

DATA SHEET
17409

DATE 3 NOV. 61

S/N 113

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Failed
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Pass
		110 lbs.	acc Pass
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
			acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Failed

NOTES:

Tester C W Arbeau

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF.

TEST REPORT NO. 15

OF

Qualification Test Report, QTR 10000070

Customer NASA	USSC Job No. 124-004
Customer P.O.	Contract No. NAS8-2456
Customer Specs NAS8-2456	USSC Specs

Unit Probe, Retractable, Transducer, Angle of Attack

Type No. Part No. 10000070 S/N 113

Test	Specification
Fungus	

Test Conducted By: Date

Test Certified By: M. A. LaVere Date 11/15/61

Test Engineer

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 15 Run No. Proj. Engineer

1.0 Requirements: NAS8-2456, Paragraph 17

1.1 "The unit shall be subjected to a fungus test as described in MIL-E-5272C, paragraph 4.8, Procedure I unless a certificate of total absence of fungus nutrients can be supplied by USSC."

2.0 Procedure:

2.1 In lieu of actual testing, U. S. Science Corp. submits the following data to support certification of total absence of fungus nutrients.

2.2 The master parts lists which follow, delineates all assemblies, sub-assemblies, and component parts utilized in the production of U. S. Science Probe, Retractable, Transducer, Angle of Attack, Part No. 10000070. Where applicable, components conform to the requirements of governing military specifications, drawings, procedures and processes. Where military specifications do not exist, materials chosen are in accordance with MIL-E-5400, Military Specification, Electronic Equipment, Aircraft, General Specification For.

2.3 Paragraph 3.1.12 of the subject specification specifies:

"3.1.12 Fungus Inert Materials:

Materials which are not nutrients for fungus shall be used to the greatest extent practicable.

3.1.12.1 The following types of materials shall not be used, except as specified herein:

Cotton	Leather
Linen	Paper and Cardboard
Cellulose Nitrate	Cork
Regenerated Cellulose	Hair and Felts
Wood	

This shall not preclude the use of the above materials in hermetically sealed assemblies, and other accepted proven and qualified products. If it is necessary to use these materials in other than hermetically sealed assemblies, paper capacitors, treated transformers, and other approved products, they shall be treated in accordance with the applicable paragraphs of this specification, and then use shall be subject to the approval of the procuring activity.

Test Engineer Test Engineer

USSC FF M 20

Unit Retractable Probe Date

Serial No. 113 Test No. 15 Run No. Proj. Engineer

3.1.12.2 The following types of materials are generally considered non-nutrients, and shall be used in preference to any of those listed in the preceding paragraph:"

(a) Metals
(b) Ceramics
(c) Mica
(d) Glass
(e) Nylon
(f) Orlon
(g) Saran
(h) Polyethylene
(i) Teflon
(j) Kel-F
(k) Natural Rubber, compounded

(m) Synthetic rubbers

(1) Neoprene
(2) Buna N
(3) Buna S
(4) Silicone
(5) Butyl
(6) Thiokol

(n) Plastics without fillers or laminates with glass, nylon, mica, or asbestos fillers:

(1) Melamine-formaldehyde
(2) Polymethyl methacrylate
(3) Urea-formaldehyde
(4) Phenol-formaldehyde
(5) Silicone resin

(o) Chemically altered cotton:

(1) 12.6 ±0.4 percent acetylated cotton

(p) Polyvinyl chloride (fungus-resistant grades only)

(q) Epoxy resin (fungus-resistant grades only)

2.4 A thorough survey of all materials and processes listed in MPL 10000070 and MPL 12792-15 was performed to ascertain that conformance to applicable paragraphs of MIL-E-5400 was maintained. This survey reveals that all materials and processes contained therein comply with suggested non-nutrient materials and processes delineated in the subject specification.

3.0 Conclusions:

3.1 It can be concluded, that since only materials and processes which are non-

Test Engineer Test Engineer

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 113 Test No. 15 Run No. Proj. Engineer

fungus nutrients have been employed 100% in the manufacture of U. S. Science Corp. 10000070 Retractable Probe Transducer, that destruction or failure as a result of fungus ingestion is improbable.

Test Engineer Test Engineer

MASTER PARTS LIST

COVER SHEET

PROJECT NUMBER: 124-02-6

	DATE
PREPARED BY H. GEBHARD	2-22-61
CHECKED BY P. Hyatt	2-24-61
APPROVED BY [signature]	3-13-61

RELEASED FOR: DATE

- ☐ ENGINEERING PRODUCTION _____
- ☐ PRE PRODUCTION _____
- ☑ PRODUCTION _____

U.S. SCIENCE CORPORATION
5221 WEST 102ND STREET
LOS ANGELES 45, CALIF.

UNIT NAME
TRANSDUCER - RETRACTABLE ANGLE OF ATTACK

MBM UNIT NUMBER 1000070 REV D

SHEET 1 OF 2

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 10000070
PROJECT NO. 124-32-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PRE	ORDER FOR: PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
1	0	10000070	✓		NC	OUTLINE DRAWING	1	1			✓		
2	1	11000538	✓		NC	FINAL ASSY	1	1			✓		
3	2	17416	✓		F	PLATE - FRONT	1	1			✓		
4	3	-93	✓			PLATE	1	1			✓		
5	3	17443	✓		NC	DOWEL PIN	2	2			✓		
6	3	-97	✓			PLUG	1	1			✓		
7	2	17417	✓		B	PLATE - REAR	1	1			✓		
8	2	17419	✓		F	RING - PROBE MTG	1	1			✓		
9	3	-99	✓			CASTING	1	1			✓		
10	2	17420	✓		NC	SPRING	4	4			✓		
11	2	18770	✓		A	ACTUATOR	1	1			✓		
12	2	17423	✓		B	RETAINER	2	2			✓		
13	2	17425	✓		B	LEAD SCREW	2	2			✓		
14	2	17426	✓		A	RACE	4	4			✓		
15	2	17427	✓		A	GEAR & SHAFT ASSY	2	2			✓		
16	3	17432	✓		A	GEAR - SPUR	1	2			✓		
17	3	17430	✓		A	SHAFT	1	3			✓		
18	3	.078-.0500 MCP		1		PIN - SPIROL	1	4			✓		
19	2	17428	✓		NC	NUT	2	2			✓		
20	2	11000903				GASKET	2	2					
21													
22													
23													

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 1000070
PROJECT NO. 134-0[illegible]-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PRE PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
24												
25												
26												
27												
28	2	17456	✓		A	CLAMP	2	2		✓		
29	2	18736	✓		B	BLOCK-MISTY	1	1		✓		
30	3	18774	✓		B	BLOCK-NOZZLE	1	1		✓		
31	4	-99	✓			BLOCK	1	1		✓		
32	4	-97	✓			PLUG	1	1		✓		
33	4	1201		15		GLYPTAL RED	A/R	A/R		✓		
34	3	17735	✓		B	NOZZLE	2	2		✓		
35	3	18784	✓		NC	CAP	2	2		✓		
36	3	2-[illegible]COMPO B273-7		2		O-RING	2	2		✓		
37	3	MS29513-6				O-RING	2	2		✓		
38	3	18790-2	✓		C	PIN	1	1		✓		
39	3	18790	✓		C	PIN	1	1		✓		
40	2	17435	✓		A	GASKET-FRONT COVER	1	1		✓		
41	2	17448	✓		E	MOTOR	1	1		✓		
42	2	17429-2	✓		B	SUPPORT-SWITCH	1	1		✓		
43	3	-98	✓			SUPPORT	1	1		✓		
44	3	22NC1-40		16		CLINCH NUT	2	4		✓		
45	2	12792-15	✓		J	TRANSDUCER	1	1		✓		
46	2	17429	✓		NC	WASHER	4	4		✓		

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 1000070
PROJECT NO. 129-02-6

ITEM	INCENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PRE PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
47	2	11522	V		NC	PROTECTOR-THD	2	2		V		
48	2	VL 20365-632C				VLV	4	4		V		
49	2	AN 5604H4				JET SCREW	2	2		V		
50	2	AN 816-4C				NIPPLE	2	2		V		
51	2	AN 515C3-0				SCREW	2	2		V		
52	2	MS 35206-33				SOC HD CAP SCREW	4	4		V		
53	2	AN 520C4-4				SCREW	2	2		V		
54												
55	2	AN515C3-28				SCREW	2	2		V		
56	2	MS 35233-43				SCREW - PAN HEAD 8-32NC x 3/8 LG	48	48				
57	2	MS 35233-17				SCREW	8	8		V		
58	2	MS 35233-34				SCREW	4	4		V		
59	2	MS 28775-20				O-RING	1	1		V		
60												
61	2			4		SEAL SCREW 8-32 x 9/32 LG TYP. S	16	16		V		
62	2			4		SEAL SCREW 8-32 x 1/2 LG TYP S	16	16		V		
63	2	8L2-FF		5		NYLINER	4	4		V		
64	2	#201				KEY-WOODRUFF	2	2		V	COML	
65	2	800-001-8		6		LOCK O SEAL	4	4		V		
66	2	SR6552D-11		7		BEARING-BALL	2	2		V		
67	2	TRA815		8		RACE	4	4		V		
68	2	NTA815		8		BEARING-THRUST	4	4		V		
69	2	B55		8		BEARING-NEEDLE	2	2		V		

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 1000020
PROJECT NO. 124-22-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PRE PROD	PROD	REMARKS	MAKE OR BUY CODE
70	2	PTO7C-12-105		9		CONNECTOR	1	1		✓	J1	
71	2	17443-5	✓		G	HOUSING & GEAR PLATE ASSY	1	1		✓		
72	3	MS35249-24				SCREW	2	2		✓		
73	3	17941	✓		C	GEAR PLATE	1	1		✓		
74	4	-92	✓			PLATE	1	1		✓		
75	4	K-2[illegible]-3		17		SPRING	9	9		✓		
76	4					ZINC CHROMATE PASTE	A/R	A/R		✓	MIL-P-[illegible]	
77	3	DS-375		15		DOWEL PIN	2	2		✓		
78	3	MS35233-43				SCREW	5	5		✓		
79	3											
80	3	17412	✓		M	HOUSING	1	1		✓		
81	4	-99	✓			CASTING	1	1		✓		
82	4	-97	✓			MACHINED BODY	1	1		✓		
83	4	12LHCFM2-32		16		NUT SCINCH	9	9		✓		
84	4	17440	✓		NC	DOWEL PIN	3	3		✓		
85	4	3585-2CNX.329		18		INSERT-LOCKING	37	37		✓		
86	4	3585-2CNX.246		16		INSERT. LOCKING	43	43		✓		
87	4	17682	✓		NC	BUSHING	4	4		✓		
88	3	A-2		20		CEMENT 'A' ACTIVATOR	A/R	A/R		✓		
89	3	11000639	✓		NC	STANDOFF	2	2		✓		
90	2	MS15795-304				WASHER-FLAT	6	6		✓		
91	2	CD-4		10		DUST CAP	2	2		✓		
92	2	10-70306-19		9		DUST CAP	2	2		✓		

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 1200-170
PROJECT NO. 129-02-0

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PRE PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
93	2					MASKING TAPE 1" WIDE	A/R	A/R		✓	COM'L	
94	2	17933	✓		B	GASKET - REAR COVER	1	1		✓		
95	2					LUSTERLESS GRAY ENAMEL	A/R	A/R		✓	TT-E-527 COLOR 26440	
96	2					ZINC CHROMATE	A/R	A/R		✓	MIL-P-8585	
97	2	17931	✓		A	PLATE	1	1		✓		
98	2	11000542	-		NC	SPACER	2	2		✓		
99	2	17924-3	✓		B	SUPPORT - SWITCH	1	1		✓		
100	3	-97	✓			SUPPORT	1	1		✓		
101	3	2206-90		16		CONNECTOR	2	-		✓		
102	2	18-4-ZZ		12		CLAMP	4	4		✓		
103	2	17992-2	✓		B	SWITCH	2	2		✓	S101 & S102	
104	2	11000458	✓		NC	SCHEMATIC	REF	REF		✓		
105	2	11000459	✓		NC	WIRING DIAGRAM	1	1		✓		
106	3	22 AWG				WIRE 19 STRAND ORANGE	A/R	A/R		✓	MIL-W-16878 TYPE B	
107	3					YELLOW				✓		
108	3					GREEN				✓		
109	3					BLUE				✓		
110	3					VIOLET				✓		
111	3					WHITE				✓		
112	3	22 AWG				WIRE 19 STRAND BROWN	A/R	A/R		✓	MIL-W-16878 TYPE B	
113	3	321017		19		TERMINAL LUG	9	9		✓		
114	3	14 AWG				VINYL SLEEVING .254	8	8		✓	MIL-I-631 TYPE F GRADE C FORM U	
115	3	SN60				SOLDER	A/R	A/R		✓	QQ-S-571	

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. [illegible]
PROJECT NO. 129-[illegible]

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PRE	PROD	PROD	REMARKS	MAKE OR BUY CODE
116	2	11000541	✓		NC	COVER ASSY - SIDE	2	2			✓		
117	3	17419	✓		F	COVER	1	2			✓		
118	3			21		PLIOBOND 20	A/R	A/R			✓		
119	3	17437	✓		A	GASKET	1	1			✓		
120	2	AN960C6L				WASHER - FLAT	4	4			✓		
121	3	MS20365-496C				NUT	6	6			✓		
122	2	#10 AWG				VINYL SLEEVING 9.0 LG	1	1			✓	MIL-I-631 TYPE SIZE FOR	
123	2	3/16-4-128		12		CLAMP	2	2			✓		
124													
125	2			22		LOCTITE	A/R	A/R			✓	GRADE H	
126													
127													
128													
129													
130													
131													
132													
133													
134													
135													
136													
137													
138	1	11000469	✓		NC	NAMEPLATE	1	1			✓		

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 10000070
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PRE PROD	PROD	REMARKS	MAKE OR BUY CODE
139	2	17431	✓		A	CLUSTER GEAR & SHAFT ASSY	1	1.		✓		
140	3	17461	✓		A	GEAR-CLUSTER	1	1		✓		
141	4	17451	✓		NC	GEAR-PINION	1	1		✓		
142	4	17460	✓		NC	GEAR-SPUR	1	1		✓		
143	4	.031-0187MCP		1		PIN-SPIROL	1	2		✓		
144	3	17432	✓		A	SHAFT	1	—		✓		
145	3	.078-050CMCP		1		PIN-SPIROL	1	—		✓		
146												
147												
148	2	17433	✓		A	CLUSTER GEAR & SHAFT ASSY	1	1		✓		
149	3	17450	✓		A	GEAR-CLUSTER	1	1		✓		
150	4	17415	✓		NC	GEAR-PINION	1	1		✓		
151	4	17444	✓		NC	GEAR-SPUR	1	1		✓		
152	4	.031-0187MCP		1		PIN-SPIROL	1	—		✓		
153	3	17430	✓		A	SHAFT	1	1		✓		
154	3	.078-0500MCP		1		PIN-SPIROL	1	—		✓		
155												
156	2	ITP10000070	✓		NC	INSPECTION TEST PROC.	1	1		✓		
157												
158												
159												
160												
161												

ADVANCE MATERIAL RELEASE / MASTER PARTS LIST

U. S. SCIENCE CORPORATION

MBM UNIT NO. 10000070

MANUFACTURER'S CODE SHEET

PROJECT NO. 124-02-6

CODE NO.	MANUFACTURER'S NAME AND ADDRESS	CODE NO.	MANUFACTURER'S NAME AND ADDRESS
1	GEN CO DANIELSON, CONN		
3	PACIFIC [illegible] CULVER CITY CALIF		
4	AUTO. ELEC. MFG CO YONKERS N.Y.		
5	THOMSON IND INC. MANHASSET N.Y.		
6	ECKHART CULVER CITY, CAL		
7	THE SHAKEPROOF CO. DANBURY, CONN.		
8	TORRINGTON CO. TORRINGTON CONN.		
9	BENDIX AVIATION CORP SIDNEY N.Y.		
10	AUTOMOTIVE CLOSURES BUFFALO, NY		
12	WECKESSER CHICAGO ILL.		
13	PIC DESIGN CORP VAN NUYS CALIF.		
15	GEN ELECTRIC L.A. CALIF.		
16	ETNA UNION N.J.		
17	KEYSTONE CARBON CO ST MARYS PA		
18	HELI-COIL CORP DANBURY CONN.		
19	AMERICAN PAMCOR HAVERTOWN, PA		
20	ARMSTRONG PROD CO. L.A. CALIF.		
21	GOODYEAR TIRE & RUBBER CO., AKRON, OHIO		
22	AMERICAN SEALANTS CO., HARTFORD, CONN.		

	MODEL	SPEC

CONTRACT NO. 124-02-6

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45 CALIF.

NUMERICAL INDEX

SHEET 1 OF 1

GROUP OR UNIT TRANSDUCER - RETRACTABLE A/A

GROUP OR UNIT DWG. NO. 10000070

CONTRACTOR ABMA

SIZE	DRAWING NUMBER	REV.	FILM INDEX	ISSUED: REVISED: PART NAME
B	12792	J		TRANSDUCER
A	17414	M		HOUSING
A	17415	NC		GEAR
D	17416	F		PLATE - FRONT
D	17417	B		PLATE - REAR
D	17418	F		COVER - SIDE
D	17419	F		MOUNTING RING
B	17420	NC		SPRING
B	17421	A		NUT
C	17460	NC		GEAR
B	17423	B		RETAINER
C	17424	B		SUPPORT
C	17425	B		LEAD SCREW
B	17426	A		RACE
C	17427	A		GEAR ASSY
B	17428	NC		NUT
B	17429	NC		WASHER
C	17430	A		SHAFT
C	17431	A		GEAR ASSY
C	17432	A		SHAFT
C	17433	A		GEAR ASSY
C	17435	A		GASKET - FRONT COVER
C	17436	A		GEAR
D	17439	B		GASKET - REAR COVER
B	17440	NC		DOWEL PIN
D	17441	C		GEAR PLATE
B	17442	B		SWITCH
D	17443	G		HOUSING & GEAR PLATE ASSY
B	17444	NC		GEAR
E	17448	E		MOTOR
C	17450	A		GEAR CLUSTER
B	17451	NC		GEAR
C	17461	A		GEAR - CLUSTER
C	17462	A		GEAR - SPUR
B	17522	NC		PROTECTOR - THD
B	17682	NC		BUSHING
B	17738	B		NOZZLE
B	18770	A		ACTUATOR
B	18774	A		BLOCK
B	18782	B		BLOCK ASSY
B	18784	NC		CAP
B	17437	A		GASKET
A	18790	C		PIN
B	10000979	NC		INSPECTION TEST PROC.
B	11000542	NC		SPACER
B	11000538	NC		FINAL ASSY
B	10000539	NC		OUTLINE DRAWING
C	11000458	NC		STANDOFF SCHEMATIC
D	11000459	NC		WIRING DIAGRAM
C	11000469	NC		NAMEPLATE

11 000 903 - GASKET SHT D

MASTER PARTS LIST

COVER SHEET

PROJECT NUMBER: 124-02-6

		DATE
PREPARED BY	H. GERHARD	2-21-61
CHECKED BY	[illegible]	2-24-61
APPROVED BY	[illegible]	3-3-61

RELEASED FOR: DATE

- ☐ ENGINEERING PRODUCTION _____
- ☐ PRE PRODUCTION _____
- ☑ PRODUCTION _____

U.S. SCIENCE CORPORATION
5221 WEST 102ND STREET
LOS ANGELES 45, CALIF.

UNIT NAME: TRANSDUCER - ANGLE OF ATTACK

MBM UNIT NUMBER: 12792-15 REV. E

SHEET 1 OF 11

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PRE PROD	PROD	REMARKS	MAKE OR BUY CODE
1	0	12792-15	✓			OUTLINE DRAWING	1					
2	1	19978-3	✓			FINAL ASSY	1					
3	2	15257-7	✓			SUB ASSY-TRANSDUCER	1					
4	3	19531-4	✓			BUTTERFLY SHAFT ASSY	1					
5	4	18549	✓			BLADE	2					
6	4	18548	✓			SHAFT	1					
7	4					SILVER SOLDER	A/R				QQ-S-561 CLASS	
8	3	11000393	✓			PROBE ASSY	1					
9	4	11000382	✓			PROBE-SUB ASSY	1					
10	5	19967	✓			TUBE	1					
11	5	18932	✓			END SEAL	2					
12	5	18560	✓			HEATER-HOUSING	1					
13	5	11020058	✓			SPINDLE	1					
14	4	18928	✓			INSULATOR	2					
15	4	19970	✓			HEATER ASSY	1					
16	5	19971	✓			SUPPORT-HEATER	2					
17	5	38 GESCALE		1		NICHROME "V" RIBBON WIRE	1				.032 X .005 X 14" LG	
18	5	E-24				WIRE - 7 STRAND BRD SILV	1				MIL-W-16878	
19	5					SILVER SOLDER	A/R				QQ-S-00655	
20	4	#274		23		CEMENT	A/R					
21	4	18928-3	✓			INSULATOR	2					
22	4	18926	✓			END PLUG	1					
23	5					SILVER SOLDER	A/R					

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PROTO	PROD	PROD	REMARKS	MAKE OR BUY CODE
24	4	B-26				WIRE - 2 STRAND BRAIDED	1					MIL-W-16878	
25	4	SN60-WAR-P2				SOLDER	A/R					QQ-S-571	
26	3	1744T	✓			HOUSING ASSY	1						
27	4	15236-3	✓			HOUSING	1						
28	5	16162	✓			CASTING	1						
29	5	3591-5CNX5/16		15		INSERT-THREADED	4						
30	4	15235-3	✓			BODY	1						
31	4	1201-3	✓			PIN	2						
32	4	MS35207-14				SCREW	4						
33	4	1201		2		CONTACT	A/R						
34	4	17649	✓			BUSHING	2						
35	4	9989	✓			FILTER-PLUG	2						
36	5	19989-99	✓	24		WIRE CLOTH-*50 GA (.0044)	1						
37	6	19989-97	✓			PLATE	2						
38	5	SN60WAC-P6				SOLDER	A/R					QQ-S-571	
39	4	A-2		3		EPOXY ADHESIVE	A/R					"A" ACTIVATOR	
40	4	AN520C1-3				SCREW	8						
41	4	TYPE C		16		LOCTITE	A/R						
42	3	AN525C4-4				SCREW	11						
43	3	MS35338-78				LOCKWASHER	11						
44	3	10398	✓			SHIELD-INNER	1						
45	3	5336BCHH		5		BEARING	1						
46	3	AMS3KDDES60171		6		BEARING	2						

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 127 ?
PROJECT NO. 124-06

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PROTO	ORDER FOR: PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
47	3	10347	✓			SHIELD-OUTER	1						
48	3	5101-37		4		RETAINING RING	1						
49	3	NAS50-87				RETAINING RING	1						
50	3	1201		2		GLYPTAL	A/R						
51	3	15267	✓			BEARING	1						
52	3	1004	✓			BEARING-THREADED	1						
53	3	5000-3 HMF		4		SNAP RING	1						
54	3	11000521	✓			PLATE ASSY	1						
55	4	11000522	✓			STANDOFF	2						
56	4	1411B		17		TERMINAL	2						
57	4	TYPE C		16		LOCTITE	A/R						
58	4	MS35249-19				SCREW	2						
59	4	15232-3	✓			PLATE	1						
60													
61													
62													
63													
64	2	15269	✓			POT ASSY "A"	1					R101	
65	3	11000657	✓			BASE-POT	1						
66	4	-99	✓	18		BASE	1						
67	4					VARNISH	A/R					MIL-V-173A	
68	9	19814	✓			TAP-ADJ PRESSURE	2						
69	4	-99	✓	25		TAP WIRE PALNEY #7	1					.012 DIA HEAT TREATED	

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-06

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USASC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PROTO	ORDER FOR: PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
70	4	720720-5	✓			POST	1						
71	4	SN60-W-AR-P2				SOLDER	A/R					QQ-S-571	
72	3	GRADE #1 CONCENTRATION MED		26		ELGIN DYMO DIAMOND COMPOUND	A/R						
73	3	30 AWG				BARE COPPER TINNED	2					MIL-W-3861 TYPE S	
74	3	15268-1	✓			RESISTANCE ELEMENT	1						
75	4			19		PLAT 85 IEN MAGNET WIRE	1					.0011@ DIA X 10' LG.	
76	4			20		THERMALEZE WIRE	1					.046 DIA X 1.767 LG.	
77	3	15997	✓			TERMINAL ASSY	2						
78	4	-99	✓	25		TAPWIRE - PALINEY #7	1					.012 DIA X .500 LG	
79	4	720720-1	✓			POST	1						
80	4	SN60-W-AR-P2				SOLDER	A/R					QQ-S-571	
81	3	1100047	✓			INSULATOR	2						
82	3												
83	3	R313		21		BONDING AGENT	A/R						
84	3	SN60-W-AR-P2				SOLDER	A/R					QQ-S-571	
85	2	15270	✓			POT ASSY "B"	1					R102	
86	3	30 AWG				BARE COPPER TINNED 1" LG.	2					MIL-W-3861 TYPE S	
87	3	GRADE #1 CONCENTRATION MED	✓	26		ELGIN DYMO DIAMOND COMPOUND	A/R						
88	3	15256	✓			BASE-POT	1						
89	3	19814	✓			TAP-ADJ PRESSURE	2						
90	4	-99	✓	25		TAPWIRE - PALINEY #7	1					.012 DIA HEAT TREATED	
91	4	720720-5	✓			POST	1						
92	4	SN60-W-AR-P2				SOLDER	A/R					QQ-S-571	

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV	DWG LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PRE PROD	PROD	PROD	REMARKS	MAKE OR BUY CODE
93	3	15268-3	✓				RESISTANCE ELEMENT	1						
94	4			22			PLAT 479 EN MAGNET WIRE	1					.0007 DIA X 9' LG	
95	4			20			THERMALEZE WIRE	1					.0005 DIA X 1.767 LG	
96	3	15997	✓				TERMINAL ASSY	2						
97	4	-99	✓	25			TAPWIRE - PALINEY #7	1					.012 DIA x .500 LG	
98	4	720720-1	✓				POST	1						
99	4	SN60-W-AR-P2					SOLDER	A/R					QQ-S-571	
100	3	19814-3	✓				TAP - ADJ PRESSURE	2						
101	4	-99	✓	25			TAPWIRE - PALINEY #7	1					.012 DIA HEAT TREATED	
102	4	720720-1	✓				POST	1						
103	4	SN60-W-AR-P2					SOLDER	A/R					QQ-S-571	
104	3	B-30					WIRE - INSUL PVC NAT 1" LG	2					MIL-W-16878	
105	3	422		8			SECON WIRE	A/R					.00035 DIA	
106	3	SN60-W-AR-P2					SOLDER	A/R					QQ-S 571	
107	3	A-2		3			EPOXY RESIN CEMENT	A/R					'A' ACTIVATOR	
108	3	11000047	✓				INSULATOR	2						
109	3	R313		21			BONDING AGENT	A/R						
110														
111	2	15963	✓				CLAMP - POT	4						
112	2	11000525	✓				WIPER MOUNT ASSY	1						
113	3	15260-3	✓				MOUNT - WIPER	1						
114	4	-99	✓				CASTING	1						
115	3	720720-3	✓				POST	2						

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USASC	MFR	DWG REV	DWG LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PRE PROD	PROD	REMARKS	MAKE OR BUY CODE
116	2	11000449	✓				HEADER ASSY	1					
117	3	2722-10-PP40		9			HEADER	1				J101	
118	3	11000067	✓				FLEX WIRE	4					
119	4	#50					WIRE-3 CONDUCTOR, EACH MADE OF 40 STRAND ONE SIL. MIL.	A/R				COM'L	
120	4	#6-128		23			SILASTIC	A/R					
121	3	B-26					WIRE-7 STRAND, PK, V10 X 10.0 LG	1				MIL-W-16878	
122	3	↕					YEL X 10.0 LG	1				↕	
123	3						BLUE X 5.5 LG	1					
124	3						WHT X 5.5 LG	1					
125	3	↕					ORN X 5.5 LG	1					
126	3	B26					WIRE-7 STRAND, NYLON ORN X 5.5 LG	1				MIL-W-16878	
127	3	#14 AWG					TUBING-VINYL .18 LG	8				MIL-I-631 TYPE 'B' GRADE 'C' FORM 'U'	
128	3	#211		10			EPOXYLITE-BLUE	A/R					
129	3	SN60-W-AR-P2					SOLDER	A/R				QQ-S-571	
130	3	1-A		10			CATALYST	A/R					
131													
132													
133	2	11000447	✓				PULLEY ASSY	1					
134	3	17131	✓				PULLEY	1					
135	3	ST-SM-2STUR		7			TERMINAL	2					
136	3	11000526	✓				STANDOFF	2					
137	4	-99					NYLON	1				MIL-P-17091	
138	4	-97					303 ST STL	1				MIL-S-5059	

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	PER UNIT	ORDER FOR: PROTO	PROD	REMARKS	MAKE OR BUY CODE
139												
140												
141												
142												
143												
144	2	15965	✓			WIPER ASSY	2					
145	3	-99	✓	11		PALNEY WIPER MAKE FROM 11654	1					
146	3					NYLON (MOLDED)	AR				MIL-P-20693 TYPE III GR E	
147												
148	2	15964	✓			SELF-DRIVE	1					
149												
150	2	15255-3	✓			COVER	1					
151	2			27		LOCKTITE					TYPE H	
152												
153												
154	2	15261	✓			SPRING	1					
155	2	15269	✓			HOUSING CONNECTOR	1					
156	3	-99	✓			CASTING	1					
157	2	1005-1	✓			"O" RING	1					
158	2	15999	✓			CLAMP	1					
159	2	10100008	✓			BLOCK	1					
160	2	AN515C2-4				SCREW	1					
161	2	AN515C4-5				SCREW	1					

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV	JETTISON	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PROTO	ORDER FOR: PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
								4						
162	2	AN515C4-6					SCREW	2						
163	2	AN565D62H4					SET SCREW #2-56 x 3/8 CRES	1					COML PASSNATE	
164	2						SET SCREW #2-56 x 3/8 CRES HEX SKT FLAT POINT	3						
165	2	MS 35649-24					NUT	2						
166	2	MS 35233-13					SCREW	2					COML PASSNATE	
167	2						SET SCREW #2-56 x 3/8 CRES HEX SKT FLAT POINT	2						
168	2	MS 15795-302					WASHER	3						
169	2	MS 35275-13					SCREW	4						
170	2	MS 35337-77					LOCKWASHER	2						
171	2	MS 35338-28					LOCKWASHER	1						
172	2	AN565PC4H4					SET SCREW							
173	3													
174	3													
175														
176	2	14259-22		✓			PLATE - SCHEMATIC	1						
177														
178	2	11000448		✓			CABLE ASSY	1					SEE SPEC CONTROL DWG BEFORE ORDERING	
179	3	19838		✓			CABLE 13.0" LG.	1						
180	3	AN3420-4					BUSHING	1/R					QQ-S-571	
181	3	SNGOW-AR-P2					SOLDER	1					J2	
182	3	PTOR-12-10P			13		CONNECTOR	10					MIL-I-631 TYPE E GRADE C FORM U	
183	3	#14					INSULATOR VINYL TUBING .25 LG							
184														

MASTER PARTS LIST
U.S. SCIENCE CORPORATION

MBM UNIT NO. 12792-15
PROJECT NO. 124-02-6

ITEM	INDENT	PART IDENTIFICATION: PART NUMBER	USSC	MFR	DWG REV	DWG LETTER	PART DESCRIPTION	NO. REQ'D: PER N/A	NO. REQ'D: PER UNIT	ORDER FOR: PRE PROD	ORDER FOR: PROD	REMARKS	MAKE OR BUY CODE
185													
186	2	SN60-W-AR-P2					SOLDER	A/R				QQ-S-571	
187	2			28			JELMAT 4 SEALANT	A/R				R 313	
188	2	#10					VINYL TUBING	A/R				MIL-I-631 TYPE F GRADE C FORM U	
189	2												
190	2	#18					VINYL TUBING	A/R				MIL-I-631 TYPE F GRADE C FORM U	
191	1	15968	✓				NAMEPLATE	1					
192													
193													
194	2	11000450	✓				WIRING DIAGRAM	1					
195	3	15974	✓				FLEX WIRE	2					
196	4	#50					WIRE-40 STRAND #38 HARD DRAWN COPPER TWISTED @ 21 TURNS/INCH	A/R				COM'L 3.50 LG	
197	4	#6-128		23			SILASTIC	A/R				3" LG	
198	3	SN60-W-AR-P2					SOLDER	A/R				QQ-S-571	
199	3	R313		21			CEMENT	A/R					
200	3	22 AWG					TINNED SOLID COPPER BUS	A/R					
201													
202													
203													
204													
205													
206													
207													

ADVANCE MATERIAL RELEASE / MASTER PARTS LIST

U. S. SCIENCE CORPORATION

MBM UNIT NO. 12792-13

PROJECT NO. 124-02-6

MANUFACTURER'S CODE SHEET

CODE NO.	MANUFACTURER'S NAME AND ADDRESS
1	[illegible]
2	[illegible]
3	ARMSTRONG PRODUCTS, WARSAW, IND.
4	WALLES KOMANDO, LONG ISLAND, N.Y.
5	MPB INC., KEENE, N.H.
6	FENN SEALING CO. NEW BRITAIN CONN.
7	SEALECTRO CORP. MAMARONECK, N.Y.
8	SECON METALS CORP. WHITE PLAINS, N.Y.
9	HERMETIC SEAL [illegible] NEWARK, N.J.
10	EPOXYLITE CORP., EL MONTE, CALIF.
11	J.M. NEY CORP. HARTFORD, CONN.
13	BENDIX AVIATION [illegible]
15	HELICOIL CORP. DANBURY, CONN.
16	AMERICAN SEALANT, HARTFORD, CONN.
17	LITTON IND., VAN NUYS, CALIF.
18	MESA PLASTICS, L.A., CALIF.
19	SIGMUND COHN CORP. MT. VERNON, N.Y.
20	PHELPS DODGE CO., L.A., CALIF.
21	C. H. BIGGS, L.A., CALIF.
22	ANGUS-CAMPBELL INC., L.A., CALIF.
23	DOW CORNING, L.A., CALIF.
24	DUCOMMUN METALS, L.A., CALIF.

CODE NO.	MANUFACTURER'S NAME AND ADDRESS
25	JACKSON EDWARDS, HOLLYWOOD, CALIF.
26	ELGIN NATL WATCH CO. ELGIN, ILLINOIS
27	AMERICAN SEALANT, L.A. CALIF
28	C.H. BIGGS L.A. CALIF

MODEL	SPEC

CONTRACT NO. 124-02-6

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

NUMERICAL INDEX

SHEET 1 OF 2

GROUP OR UNIT TRANSDUCER A/A

GROUP OR UNIT DWG. NO. 12792-15

CONTRACTOR ABMA

SIZE	DRAWING NUMBER	REV.	FILM INDEX	ISSUED: REVISED: PART NAME
B	10348	D		SHIELD - INNER
E	12792	K		OUTLINE DRAWING
C	15235	F		BODY
D	15236	D		HOUSING
C	15255	B		COVER
C	15256	E		BASE - POT "B"
D	15257	H		SUB ASSY
C	15260	F		MOUNT - WIPER
B	15261	D		SPRING
C	15264	A		HOUSING - CONNECTOR
B	15267	A		BEARING
C	15268	B		RESISTANCE ELEMENT
C	15269	H		POT ASSY "A"
C	15270	H		POT ASSY "B"
D	16162	NC		CASTING
B	15914	C		FLEX WIRE
B	15963	A		CLAMP
B	15964	B		BELT - DRIVE
B	15965	E		WIPER ARM ASSY
C	15968	C		NAMEPLATE
A	15997	A		TERMINAL ASSY
B	15999	A		CLAMP
D	17447	E		HOUSING ASSY
B	17449	B		BUSHING
C	18531	D		BUTTERFLY & SHAFT ASSY
B	18548	D		SHAFT
E	18549	A		BLADE
C	18560	B		HEATER HOUSING
B	18926	A		END PLUG
B	18928	C		INSULATOR
B	18932	B		END SEAL
B	19814	C		TAP - ADJUSTABLE PRESSURE
C	19835	B		CABLE - 13.0" LG.
D	19967	A		TUBE
C	19970	B		HEATER ASSY
C	19971	B		SUPPORT - HEATER
E	19978	B		FINAL ASSY.

USSC FORM 21

MODEL	SPEC

CONTRACT NO. 124-02-6

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

NUMERICAL INDEX

GROUP OR UNIT TRANSDUCER A/A

GROUP OR UNIT DWG. NO. 12792-15

CONTRACTOR ABMA

SIZE	DRAWING NUMBER	REV.	FILM INDEX	ISSUED / REVISED: PART NAME
B	19989	B		FILTER-AIR
B	720720	E		POST
C	11010000 08	NC		BLOCK
B	11000047	NC		INSULATOR
B	11000058	NC		SPINDLE
B	11000067	B		FLEX WIRE
D	11000382	NC		PROBE-SUB ASSY
D	11000383	A		PROBE ASSY
C	17131	C		PULLEY
C	11000447	A		PULLEY ASSY
C	11000448	A		CABLE ASSY
C	11000449	NC		HEADER ASSY
D	11000450	C		WIRING DIAGRAM
C	15232	F		PLATE
B	10347	F		SHIELD-OUTER
B	1001	M		DOWEL PIN
A	1004	NC		BEARING-THREADED SLEEVE
A	1005	B		O-RING
D	14259	H		SCHEMATIC & INSTRUCTION PLATES
C	11000521	A		PLATE ASSY
B	11000522	NC		STANDOFF
C	11000525	A		WIPER MOUNT ASSY
B	11000526	A		STANDOFF
D	11000657	NC		BASE-POT

U.S. SCIENCE CORPORATION
5221 W 102ND STREET
LOS ANGELES 45 CALIF

TEST REPORT NO. 16

OF

Qualification Test Report, QTR 10000070

Customer	NASA	USSC Job No.	124-004
Customer P.O.		Contract No.	NAS8-2456
Customer Specs	NAS8-2456	USSC Specs	ITP 19600

Unit: Probe, Retractable, Transducer, Angle of Attack

Type No. _____ Part No. 10000070 S/N 107

Test	Specification
Endurance	NAS8-2456 ITP 19600

Test Conducted By: J. Thompson, C. Arbeau, Test Technicians — Date 10/17/61 – 10/24/61

Test Certified By: M. A. LaVere, Test Engineer — Date 10/24/61

USSC FORM 15

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 16 Run No. Proj. Engineer

1.0 Requirement: NAS8-2456, Paragraph 9

1.1 "The unit shall be set up on a stand such that the extend and retraction mechanism can be operated without damage to the probe of the transducer. A timing circuit shall be attached to the extend-retract switching mechanism to give the following operational cycles":

Extend	Maximum Time -	20 Seconds
Power Off		20 Seconds
Retract	Maximum Time -	20 Seconds
Power Off		20 Seconds

1.2 The above constitutes one duty cycle. As it is considered that the motor, or micro-switches, will be the governing factor of the retraction mechanism life, it is proposed to run a mean time to failure on all components. Thus, it is permissible to change a switch or motor after failure provided that the failure time and condition is recorded.

a. Test

The duty cycle shall be repeated for 100 hours. At this point, the unit shall be removed from the fixture and subjected to the tests of ITP 19600.

b. Duration

The tests of "a" shall be repeated until 100 hours have been accumulated.

2.0 Procedure:

2.1 The unit was installed in the fixture previously used for vibration, in a manner which allowed the extend and retract mechanism to be operated. The probe chamber plate, previously used in the altitude shock test was installed to protect the probe from damage during test.

2.2 Figure 1 of this report is the schematic diagram of the operation, monitor and protective circuitry utilized to effect the test requirements. The circuit consists of a DPDT magnetic latching relay (K1) and four SPST thermal relays, K2, K3, K4 and K5.

2.3 Operation is as follows: The positive potential applied to the input terminal is routed simultaneously to pin A of the retraction housing connector J1, through the closed contacts of motor limit switch S101, to the N. O. contacts and ac-

Test Engineer Test Engineer

USSC FF 4 20

tuation coil of relay K5, to pin A2 of relay K1, and J1 connector pin C. Negative potential applied to the input terminal is routed simultaneously to pins B2, X2 and Y2 of relay K1, pin 6 of relay K4, and pin 3 of relays K2 and K3.

2.4 Assume that the probe is retracted when power is applied. In approximately 20 seconds, relay K5 closes which actuates and latches relay K1. Positive potential is applied through contact A1 of relay K1, through the closed contacts of K3 to pin E of connector J1, and to pin 2 of relay K3. Negative potential reaches connector J1 pin F through contact B1 of relay K1 and N.C. contacts of relay K2. The motor will then actuate. Since relay K3 has a twenty second delay before actuation, the extend cycle must be completed in less than this time, as power to the motor will be broken if relay K3 actuates. At the moment of transducer movement, limit switch S101 is deactivated and power to relay K5 is broken.

2.5 At the conclusion of the extend cycle, motor limit switch, S102 is actuated placing positive potential to pins 1 and 8 of relay K4. Relay K4 actuates in approximately 20 seconds and applies power to relay K1 which now actuates and latches. The potential is directed to connector J1 pin F through K1 relay contact A3 and N.C. contacts of relay K2. Negative potential is applied to connector J1, pin G through contact B3 of relay K1. The motor will then actuate. Since relay K2 has a twenty second delay before actuation, the retraction cycle must be completed in less than this time as power to the motor will be broken if K2 actuates.

2.6 A counter is placed in series with the 28 volt pulse which appears once each complete cycle at motor limit switch S101. This effectively counts the number of complete operations to which the equipment has been subjected.

2.7 At 1230 hours, 17 October 1961, the endurance test was activated. The elapsed time, counter reading, extend and retract times, were monitored twice daily. The tabulation below indicates the readings obtained.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 16 Run No. Proj. Engineer

Date	Hour	Elapsed Time Indicator Reading	Elapsed Time	Counter Reading	Time per cycle (secs) (Avg. of 5 cycles) Ret	OFF	Ext	OFF	Total
17 Oct.	1230	5070.3	0.0	0.0	12	23	12	20	67
17 Oct.	1600	5073.8	3.5	188	12	23	12	20	67
18 Oct.	0900	5090.8	20.5	1101	12	23	12	20	67
18 Oct.	1600	5097.8	27.5	1475	12	23	12	21	68
19 Oct.	0830	5114.3	44.0	2413	12	20	12	19	63
19 Oct.	1600	5121.5	51.2	2799	12	20	12	18	62
20 Oct.	0830	5138.1	67.8	3795	12	20	12	16	60
20 Oct.	1630	5146.1	75.8	4277	12	14	12	21	59.5
21 Oct.	1730	5171.1	100.8	5657	12	14	12	23	61

2.8 To insure against borderline failure, the test was allowed to continue for an additional 3 hours. The results of this post test period were similar to the above. There were no failures observed during the entire test period. The unit was subjected to the test requirements of ITP 19600 and a data sheet indicating the results of these tests follows the text of this report.

3.0 Conclusions:

3.1 Post test inspection of the unit indicated that some degree of component wear had occurred as a result of this test. The unit was capable of meeting the test requirements of ITP 19600 except Air Jet Calibration and Leak Test. Statements concerning Air Jet Calibration are contained in the "Conclusion" section of test report No. 1. Statements concerning Leak Test are contained in the "Conclusion" section of Test Report No. 4.

3.2 It can be concluded as a result of this test, that the unit is capable of proper operation in excess of 100 hours.

Test Engineer Test Engineer

USSC FORM 20

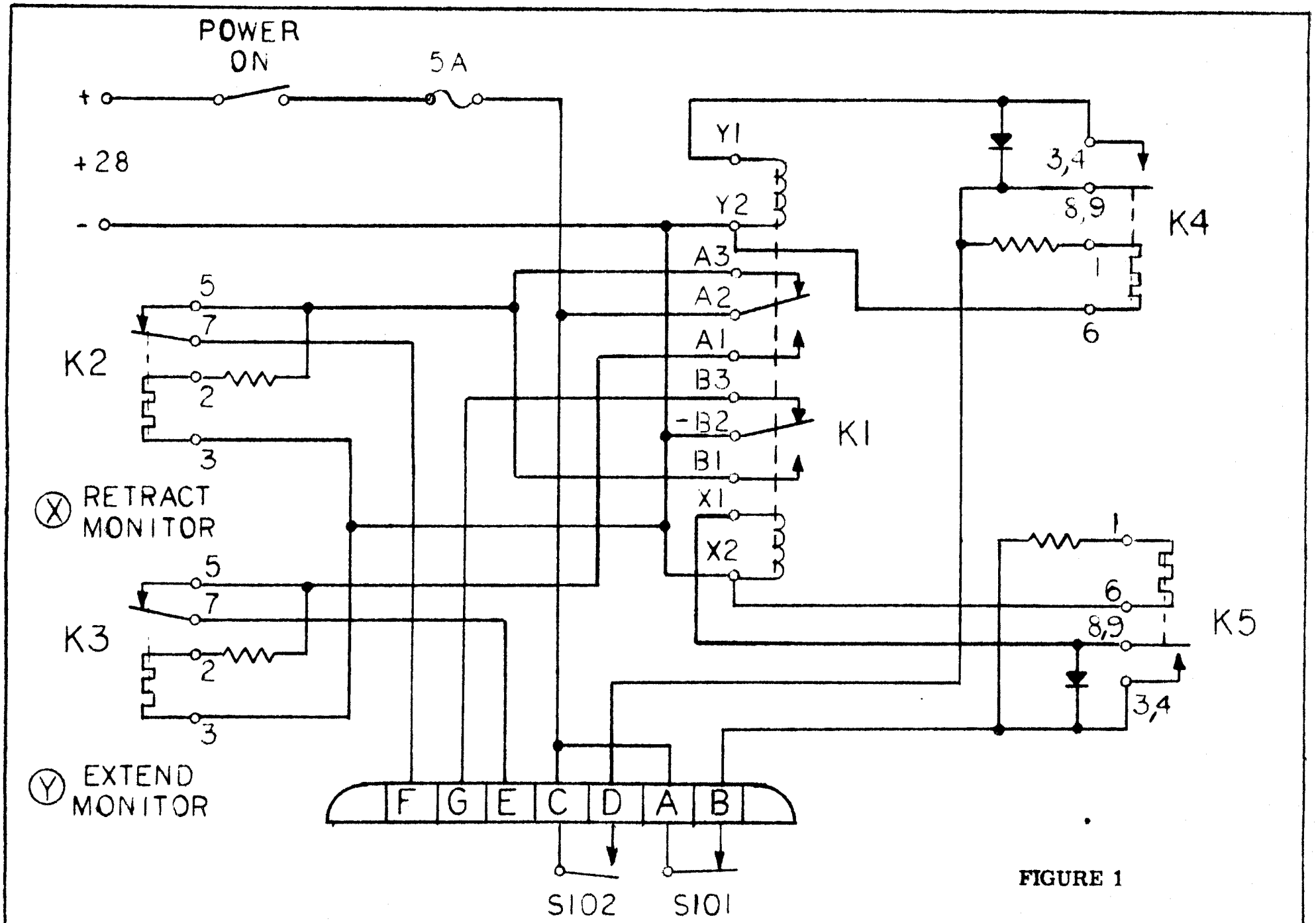
POWER
ON
5A
+
+28
-
Y1
Y2
A3
A2
A1
B3
-B2
B1
X1
X2
K1
K2
K3
K4
K5
3,4
8,9
1
6
5
7
2
3
RETRACT
MONITOR
EXTEND
MONITOR
F
G
E
C
D
A
B
S102
S101

FIGURE 1

U.S. SCIENCE CORPORATION
5221 W. 102ND STREET
LOS ANGELES 45, CALIF.

TEST DATA SHEET

Unit Retractable Probe Date

Serial No. 107 Test No. 16 Run No. Proj. Engineer

Test Equipment

Power Supply, 28 VDC, Perkin, MR532-15A
Running Time Meter, JBT, 31EX
Electronic Counter, Beckman, 5230
Operation and Monitor Fixture, USSC Special Design
Wind Tunnel, Chrysler Corp. Part No. 10313088B
Static and Dynamic Test Console, Chrysler Corp. Part No. 10313089A
Stop Watch, Jaquet (No part number shown)

Test Engineer Test Engineer

100 HOUR ENDURANCE TEST

DATA SHEET
17409

DATE 24 OCT. 61

S/N 107

TEST	INSTRUCTIONS		STAMP
1. Megger	(Green portion of insulation resistance scale)		acc Pass
2. Zero	(Meter can be zeroed)		acc Pass
3. Linearity	(Green portion of linearity scale)	+14°	acc Pass
		+ 7°	acc Pass
		- 7°	acc Pass
		-14°	acc Pass
4. Extend	(Maximum 15 seconds)		acc Pass
Retract	(Maximum 15 seconds)		acc Pass
5. Phase Lag	(15° maximum)		acc Pass
6. Noise	(Test ok lamp remains on)		acc Pass
7. Air Jet Calibration	+ (Meter deflects to left of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
	- (Meter deflects to right of zero but on scale)	90 lbs.	acc Pass
		100 lbs.	acc Failed
		110 lbs.	acc Failed
8. Heater Test	(Max. Temp. after 10 min. 135°F±5°)		acc Pass
	("on" when extended-"off" when retracted)		acc Pass
9. Leak Test	(Maximum leakage 1.5 PSIG in 10 minutes)		acc Pass
			acc Failed

NOTES:

Tester C W Arbeau